

# **Attachment 7**

***Material Safety Data Sheets of Materials  
Used at Marsa Power Station***

No.	List of MSDS For Fuels & Chemicals	Use
1	Heavy Fuel Oil (HFO)	Boiler fuel
2	Gas Oil	OCGT & CCGT fuel
3	<i>FireMag / PentoMag 2000</i>	Fuel Oil Additive against Vanadium Oxide
4	<i>Fuelsolv PEP990</i>	Fuel Oil additive to improve combustion efficiency
5	Sodium Hydroxide	Evaporator, demineralisation & boiler feed water treatment
6	Sodium Bicarbonate	Acid spill treatment
7	<i>Cortrol OS5009</i>	Boiler water intake oxygen scavenger
8	Tri Sodium Phosphate	Boiler feed water treatment
9	<i>Belgard EV</i>	Evaporator antiscaling agent
10	Sulphuric Acid (98%)	Demineralisation & sea water treatment
11	Sulfamic Acid	Evaporator acid cleaning treatment
12	<i>Biocaf 1320</i>	Sea water treatment against organic fouling

# MATERIAL SAFETY DATA SHEET

According to EU Directive 93/112/EEC  
READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET  
BEFORE HANDLING OR DISPOSING OF PRODUCT

## 32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max

### 1. PRODUCT AND COMPANY NAME

#### PRODUCT CODE AND NAME

32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max

#### DESCRIPTION

Heavy Fuel Oil

#### COMPANY

FUEL & MARINE MARKETING LLC

3336 Richmond Ave

Houston, TX 77098

U.S.A.

Tel : +1(713)752-3942

Fax : +1(713)752-3981

Emergency Phone Number : +44/(0)18 65 407 333

Medical Emergency Number : +1/(504)680-1900

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

Name	% Wt	CAS No.	EC No.
Heavy fuel oil	100	68476-33-5	270-675-6
T R 45	May cause cancer.		
R 52/53	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.		

### 3. HAZARDS IDENTIFICATION

#### Warning statement

CONTAINS COMPONENTS WHICH MAY CAUSE CANCER IN MAN  
HYDROGEN SULPHIDE MAY BE RELEASED WHEN HEATED  
FLAMMABLE HEADSPACE VAPOURS MAY BE PRESENT  
HARMFUL TO THE AQUATIC ENVIRONMENT

#### Acute effects of exposure to man

##### Inhalation

Contains or may release hydrogen sulphide (H<sub>2</sub>S) gas. H<sub>2</sub>S concentrations above permissible concentrations can cause headache, dizziness, nausea, vomiting, and diarrhoea. At concentrations above 300 ppm, respiratory paralysis, causing unconsciousness and death, can occur.

##### Skin contact

Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts of material.  
Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling.  
Believed not to be a skin sensitiser.

##### Eye contact

May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

## 32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max

### Ingestion

If more than several mouthfuls are swallowed, abdominal discomfort, nausea and diarrhoea may occur.

### Chronic effects of exposure to man

#### Medical conditions aggravated by exposure

Because of its irritating properties, repeated skin contact may aggravate an existing dermatitis (skin condition).

### Other remarks

This product, or a component of this product, has caused skin cancer when repeatedly applied to the skin of laboratory animals without any effort to remove the material between applications.

### Effects of exposure to the environment

Some short-term toxicity to aquatic and marine organisms.

## 4. FIRST AID MEASURES

### Route of exposure

#### Inhalation

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may administer oxygen. Get immediate medical attention. External cardiac massage may be instituted if the heart has stopped.

#### Skin contact

Wash skin with plenty of soap and water until all traces of material are removed. Remove and clean contaminated clothing and shoes. Get medical attention if skin irritation persists or skin contact has been prolonged.

#### Eye contact

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

#### Ingestion

The ingestion of large amounts of product is unlikely. Should it occur give two glasses of water (500 ml) if patient is conscious and can swallow. Do not induce vomiting. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

### Other recommendations

Remove and dry-clean or launder clothing soaked or soiled with this material before reuse. Dry cleaning of contaminated clothing may be more effective than normal laundering. Inform individuals responsible for cleaning of potential hazards associated with handling contaminated clothing.

The odour of hydrogen sulphide (H<sub>2</sub>S) gas is offensive and similar to rotten eggs. H<sub>2</sub>S gas deadens the sense of smell, even at low concentrations. DO NOT depend on odour to detect presence of gas.

## 32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max

Warning. Rescue of overexposed persons should be attempted only after notifying others of the emergency and only if appropriate personal protective equipment and positive pressure self-contained breathing apparatus (SCBA) is available.

### 5. FIRE-FIGHTING MEASURES

#### Suitable extinguishing media

Use water fog, dry powder, foam or carbon dioxide. Use water to cool fire-exposed containers. If a leak or spill has not ignited, use water fog to disperse the vapours and to provide protection for personnel attempting to stop the leak.

#### Extinguishing media which must not be used for safety reasons

Water jet

#### Special exposure hazards arising from the substance or preparation itself, combustion products, resulting gases

Hydrogen sulphide (H<sub>2</sub>S) may be released when heated. In case of fire - Always call the fire brigade. Small fires, such as those capable of being fought with a hand-held extinguisher, can normally be fought by a person who has received instruction on the hazards of flammable liquid fires. Fires that are beyond that stage should only be tackled by people who have received hands-on training. Ensure escape path is available.

#### Special protective equipment for firefighters

The nature of special protective equipment required will depend upon the size of the fire, the degree of confinement of the fire and the natural ventilation available. Fire-resistant clothing and self-contained breathing apparatus is recommended for fires in confined spaces and poorly-ventilated areas. Full fire-proof clothing is recommended for any large fires involving this product.

### 6. ACCIDENTAL RELEASE MEASURES

#### Procedures in case of accidental release or leakage

Ventilate area. Avoid breathing vapour. Use self-contained breathing apparatus or supplied air mask for large spills or confined areas. Contain spill if possible. Wipe up or absorb on suitable material and shovel up. Prevent entry into sewers and waterways. Avoid contact with skin, eyes or clothing.

### 7. HANDLING AND STORAGE

#### Handling

Local exhaust ventilation recommended if generating vapour, dust, or mist. If exhaust ventilation is not available or inadequate, use approved respirator as appropriate.

This product may contain volatile hydrocarbons which may accumulate in the container headspace, thereby creating a flammable or explosive atmosphere.

Hydrogen sulphide (H<sub>2</sub>S) may be released when heated.

## 32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max

### Storage

Transport, handle and store in accordance with applicable local regulations and only in labelled containers designed for this product. Ground and bond shipping container, transfer line and receiving container.  
Keep away from heat, sparks, flame and other sources of ignition. Protect containers against static electricity, lightning and physical damage.

## **8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

### Respiratory protection

Airborne concentrations should be kept to lowest levels possible. If vapour, mist or dust is generated, use approved respirator as appropriate. Supplied air respiratory protection should be used for cleaning large spills or upon entry into tanks, vessels, or other confined spaces.  
Oxygen levels should be at least 19.5 % in confined spaces or other work areas.

### Hand and skin protection

Protective clothing such as uniforms, coveralls or lab coats should be worn. Launder or dry-clean when soiled. Gloves and boots resistant to chemicals and petroleum distillates required.

### Eye protection

Chemical type goggles or face shield recommended to prevent eye contact.

### Exposure limit for the product

None established for product.  
Hydrogen sulphide (H<sub>2</sub>S) may be released on heating and may accumulate in confined spaces.  
Hydrogen sulphide : ACGIH TLV-TWA 10 ppm STEL 15 ppm.

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance	Dark brown liquid
Odour	Petroleum odour
Flash point, °C	60 min (PMCC)
Relative density	0.991 max @ 15 °C
Viscosity	> 420 mm <sup>2</sup> /s @ 50 °C
Boiling point/range, °C	160 - 600

## **10. STABILITY AND REACTIVITY**

### Conditions to avoid

Sources of ignition such as naked flames, sparks, hot surfaces.

### Materials to avoid

Avoid contact with strong oxidising agents.

### Hazardous decomposition products

Carbon monoxide, carbon dioxide, aldehydes and ketones.  
Hydrogen sulphide (H<sub>2</sub>S) may be released on heating and may accumulate in confined spaces.

**32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max**

**11. TOXICOLOGICAL INFORMATION**

**Acute**

Inhalation

Likely to be irritating to the respiratory tract if high concentrations of mists or vapour are inhaled.

May cause nausea, dizziness, headaches and drowsiness if high concentrations of vapour are inhaled.

May be toxic when hydrogen sulphide is present in the vapour.

Skin contact

Slightly irritating to the skin.

Believed not to be a skin sensitiser.

Eye contact

Slightly irritating to the eyes.

Ingestion

Unlikely to cause harm if accidentally swallowed in small doses, though larger quantities may cause nausea and diarrhoea.

**Chronic**

This product, or a component of this product, has caused skin cancer when repeatedly applied to the skin of laboratory animals without any effort to remove the material between applications.

**12. ECOLOGICAL INFORMATION**

Mobility

Spillages may penetrate the soil causing ground water contamination.

Persistence and degradability

Believed to biodegrade slowly.

Potential to bioaccumulate

This product is expected to bioaccumulate.

Aquatic toxicity

Some short-term toxicity to aquatic and marine organisms.

Limited data available indicates aquatic toxicity in the range 10-100 mg/l.

Remarks

This product, due to its density, can either float, sink or form emulsions if spilled on to water depending on the environmental conditions.

**13. DISPOSAL CONSIDERATIONS**

Disposal

Dispose in a safe manner in accordance with local/national regulations.

Remarks

None

**14. TRANSPORT INFORMATION**

Sea transport

UN No

1268

Proper shipping name

PETROLEUM DISTILLATES, N.O.S. (contains hydrocarbons)

**32794 HEAVY FUEL OIL,> 420 MM<sup>2</sup>/S (AT 50C),D=0.991 max**

IMO, IMDG Class/Packing group	3.3 / III
Marine pollutant	No
EmS No	3-07
MFAG Table No	311

**Road/rail transport**

UN No	1268
Proper shipping name	PETROLEUM DISTILLATES, N.O.S. (contains hydrocarbons)
ADR/RID Class/Packing group	3.31(c) / III
Hazard identification No	30
CEPIC Tremcard No	30G35
UK Emergency action code	3Z
Pollutant to the aquatic environment	No

**Inland waterways**

ADNR Class	3.31(c)
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**Air transport**

UN No	1268
Proper shipping name	PETROLEUM DISTILLATES, N.O.S. (contains hydrocarbons)
IATA/ICAO Class/Packing group	3 / III

**15. REGULATORY INFORMATION****Labelling information**

Heavy fuel oil EC No. 270-675-6

**Indication of danger**

T TOXIC

**Risk phrases**

T R 45 May cause cancer.  
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Safety phrases**

S 53 Avoid exposure - obtain special instructions before use.  
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).  
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.



## 32794 HEAVY FUEL OIL, > 420 MM<sup>2</sup>/S (AT 50C), D=0.991 max

### Additional information

Refer to any national measures that may be relevant.

### 16. OTHER INFORMATION

Hazardous concentrations of hydrogen sulphide (H<sub>2</sub>S) gas can accumulate in storage and rundown tanks, marine vessel compartments, sump pits or other confined spaces. When opening valves, hatches and dome covers, stand upwind, keep face as far from the opening as possible and avoid breathing any gases or vapours. When exposure concentrations are unknown and respiratory protection is not used, personal H<sub>2</sub>S warning devices should be worn. These devices should not be relied on to warn of lifethreatening concentrations. H<sub>2</sub>S fatigues the sense of smell rapidly. The rotten egg odour of H<sub>2</sub>S disappears quickly, even though high concentrations are still present. The company recommends that all exposures to this product be minimized by strictly adhering to recommended occupational control procedures to avoid any potential adverse health effects. The ash from combustion products will contain nickel, vanadium and other potentially toxic heavy metal oxides. Take appropriate precautions to avoid contact with and inhalation of ash and ash dust from combustion and exhaust spaces.

All information contained in this Material Safety Data Sheet and, in particular, the health and safety and environmental information is accurate to the best of our knowledge and belief as at the date of issue specified. However, the Company makes no warranty or representation, express or implied, as to the accuracy or completeness of such information.

The provision of this Material Safety Data Sheet is not intended, of itself, to obviate the need for all users to satisfy themselves that the product described is suitable for their individual purposes and that the safety precautions and environmental advice are adequate for their individual purposes and situation. Further, it is the user's obligation to use this product safely and to comply with all applicable laws and regulations concerning the use of the product.

The company accepts no responsibility for any injury, loss or damage, consequent upon any failure to follow the safety and other recommendations contained in this Material Safety Data Sheet, nor from any hazards inherent in the nature of the material, nor from any abnormal use of the material.

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# MATERIAL SAFETY DATA SHEET

According to EU Directive 93/112/EEC  
READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET  
BEFORE HANDLING OR DISPOSING OF PRODUCT

## 29736 GASOIL

### 1. PRODUCT AND COMPANY NAME

#### PRODUCT CODE AND NAME

29736 GASOIL

#### DESCRIPTION

Gas Oils

#### COMPANY

FUEL & MARINE MARKETING LLC

3336 Richmond Ave

Houston, TX 77098

U.S.A.

Tel : +1(713)752-3942

Fax : +1(713)752-3981

Emergency Phone Number : +44/(0)18 65 407 333

Medical Emergency Number : +1/(504)680-1900

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Name</u>	<u>% Wt</u>	<u>CAS No.</u>	<u>EC No.</u>
Fuels, diesel	95 - 99.99	68334-30-5	269-822-7
Xn R 40	Possible risk of irreversible effects.		
Xn R 65	Harmful: may cause lung damage if swallowed.		
R 66	Repeated exposure may cause skin dryness or cracking		
R 52/53	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.		

Product contains small amounts of additives.

### 3. HAZARDS IDENTIFICATION

#### Warning statement

POSSIBLE RISK OF IRREVERSIBLE EFFECTS FOLLOWING PROLONGED  
AND REPEATED SKIN EXPOSURE  
MAY ENTER LUNGS AND CAUSE DAMAGE IF SWALLOWED  
MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT  
HYDROGEN SULPHIDE MAY BE RELEASED WHEN HEATED  
EXPOSURE TO VAPOUR / MIST MAY CAUSE DIZZINESS AND  
DROWSINESS  
HARMFUL TO THE AQUATIC ENVIRONMENT

#### Acute effects of exposure to man

##### Inhalation

Vapours or mist may cause irritation of the nose and throat, headache,  
nausea, vomiting, dizziness, drowsiness, euphoria, loss of coordination,  
and disorientation. In poorly ventilated areas or confined spaces,  
unconsciousness and asphyxiation may  
result.

##### Inhalation

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## 29736 GASOIL

Inhalation of vapours or mist may result in the absorption of potentially harmful amounts of material.

### Skin contact

Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling.  
Believed not to be a skin sensitiser.

### Eye contact

May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

### Ingestion

If more than several mouthfuls are swallowed, abdominal discomfort, nausea and diarrhoea may occur.  
Aspiration may occur during swallowing or vomiting, resulting in lung damage.

### Chronic effects of exposure to man

#### Medical conditions aggravated by exposure

Because of its irritating properties, repeated skin contact may aggravate an existing dermatitis (skin condition).

#### Other remarks

Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts of material.

#### Effects of exposure to the environment

Some short-term toxicity to aquatic and marine organisms.

## 4. FIRST AID MEASURES

### Route of exposure

#### Inhalation

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may administer oxygen. Get immediate medical attention. External cardiac massage may be instituted if the heart has stopped.

#### Skin contact

Wash skin with plenty of soap and water until all traces of material are removed. Remove and clean contaminated clothing and shoes. Get medical attention if skin irritation persists or skin contact has been prolonged.

#### Eye contact

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

#### Ingestion

Do not induce vomiting. Get medical attention. Never give anything by mouth to an unconscious or convulsing person.

## 29736 GASOIL

### Other recommendations

Aspiration of this product during induced vomiting can result in lung injury which may be fatal. If evacuation of stomach contents is considered necessary, use method least likely to cause aspiration, such as gastric lavage after endotracheal intubation.

Remove and dry-clean or launder clothing soaked or soiled with this material before reuse. Dry cleaning of contaminated clothing may be more effective than normal laundering. Inform individuals responsible for cleaning of potential hazards associated with handling contaminated clothing.

## 5. FIRE-FIGHTING MEASURES

### Suitable extinguishing media

Use water fog, dry powder, foam or carbon dioxide. Use water to cool fire-exposed containers. If a leak or spill has not ignited, use water fog to disperse the vapours and to provide protection for personnel attempting to stop the leak.

### Extinguishing media which must not be used for safety reasons

Water jet

### Special exposure hazards arising from the substance or preparation itself, combustion products, resulting gases

In case of fire - Always call the fire brigade. Small fires, such as those capable of being fought with a hand-held extinguisher, can normally be fought by a person who has received instruction on the hazards of flammable liquid fires. Fires that are

### combustion products, resulting gases

beyond that stage should only be tackled by people who have received hands-on training.

Ensure escape path is available.

### Special protective equipment for firefighters

The nature of special protective equipment required will depend upon the size of the fire, the degree of confinement of the fire and the natural ventilation available. Fire-resistant clothing and self-contained breathing apparatus is recommended for

### Special protective equipment for firefighters

fires in confined spaces and poorly-ventilated areas. Full fire-proof clothing is recommended for any large fires involving this product.

## 6. ACCIDENTAL RELEASE MEASURES

### Procedures in case of accidental release or leakage

Ventilate area. Avoid breathing vapour. Use self-contained breathing apparatus or supplied air mask for large spills or confined areas.

### Procedures in case of accidental release or leakage

Contain spill if possible. Wipe up or absorb on suitable material and shovel up. Prevent entry into sewers and waterways. Avoid contact with skin, eyes or clothing.

## 7. HANDLING AND STORAGE

## 29736 GASOIL

### Handling

Local exhaust ventilation recommended if generating vapour, dust, or mist. If exhaust ventilation is not available or inadequate, use approved respirator as appropriate.

This product may contain volatile hydrocarbons which may accumulate in the container headspace, thereby creating a flammable or explosive atmosphere.

### Storage

Transport, handle and store in accordance with applicable local regulations.

Ground and bond shipping container, transfer line and receiving container if there is a chance that the tank has previously contained low-flash material.

Keep away from heat, sparks, flame and other sources of ignition.

Protect containers against static electricity, lightning and physical damage.

## **8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

### Respiratory protection

Airborne concentrations should be kept to lowest levels possible. If vapour, mist or dust is generated, use approved respirator as appropriate. Supplied air respiratory protection should be used for cleaning large spills or upon entry into tanks, vessels, or other confined spaces.

### Respiratory protection

Oxygen levels should be at least 19.5 % in confined spaces or other work areas.

### Hand and skin protection

Protective clothing such as uniforms, coveralls or lab coats should be worn. Launder or dry-clean when soiled. Gloves and boots resistant to chemicals and petroleum distillates required.

### Eye protection

Chemical type goggles or face shield recommended to prevent eye contact.

### Exposure limit for the product

None established for product.

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance	Clear liquid
Odour	Petroleum odour
Flash point (PMCC), °C	56 min
Relative density	0.82 - 0.86 @ 15°C
Viscosity	2 - 5 mm <sup>2</sup> /s @ 40°C
Boiling point/range, °C	160 - 385

## **10. STABILITY AND REACTIVITY**

### Conditions to avoid

Sources of ignition such as naked flames, sparks, hot surfaces.

### Materials to avoid

Avoid contact with strong oxidising agents.

## 29736 GASOIL

### Hazardous decomposition products

Carbon monoxide, carbon dioxide, aldehydes and ketones.  
Hydrogen sulphide (H<sub>2</sub>S) may be released on heating and may accumulate in confined spaces.

## **11. TOXICOLOGICAL INFORMATION**

### **Acute**

#### Inhalation

Likely to be irritating to the respiratory tract if high concentrations of mists or vapour are inhaled.  
May cause nausea, dizziness, headaches and drowsiness if high concentrations of vapour are inhaled.  
May be toxic when hydrogen sulphide is present in the vapour.

#### Skin contact

Slightly irritating to the skin.  
Believed not to be a skin sensitizer.

#### Eye contact

Slightly irritating to the eyes.

#### Ingestion

Unlikely to cause harm if accidentally swallowed in small doses, though larger quantities may cause nausea and diarrhoea. Will injure the lungs if aspiration occurs, eg. during vomiting.

### **Chronic**

This product, or a component of this product, has caused skin cancer when repeatedly applied to the skin of laboratory animals without a try effort to remove the material between applications.

## **12. ECOLOGICAL INFORMATION**

#### Mobility

Not determined

#### Persistence and degradability

According to EC criteria : Not readily biodegradable

#### Potential to bioaccumulate

This product is expected to bioaccumulate.

#### Aquatic toxicity

Some short-term toxicity to aquatic and marine organisms.

#### Remarks

None

## **13. DISPOSAL CONSIDERATIONS**

#### Disposal

Dispose in a safe manner in accordance with local/national regulations.

#### Remarks

None

## **14. TRANSPORT INFORMATION**

#### Sea transport

**29736 GASOIL**

UN No	1202
Proper shipping name	GAS OIL
IMO, IMDG Class/Packing group	3.3 / III
Marine pollutant	No
EmS No	3-07
MFAG Table No	311

**Road/rail transport**

UN No	1202
Proper shipping name	GAS OIL
ADR/RID Class/Packing group	3,31(c) / III
Hazard identification No	30
CEPIC Tremcard No	26
UK Emergency action code	3Z
Pollutant to the aquatic environment environment	No

**Inland waterways**

ADNR Class	3,31(c)
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**Air transport**

UN No	1202
Proper shipping name	GAS OIL
IATA/ICAO Class/Packing group	3 / III

**15. REGULATORY INFORMATION****Labelling information**

<u>Indication of danger</u>	Xn HARMFUL
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**Risk phrases**

Xn R 40	Possible risk of irreversible effects.
Xn R 65	Harmful: may cause lung damage if swallowed.
R 66	Repeated exposure may cause skin dryness or cracking.

**Safety phrases**

S 2	Keep out of the reach of children.
S 24	Avoid contact with skin.
S 36/37	Wear suitable protective clothing and gloves.
S 43	In case of fire, use CO <sub>2</sub> , dry chemical or foam. Never use water.

## 29736 GASOIL

S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

S 62 If swallowed, do not induce vomiting; seek medical advice immediately and show this container or label.

### Hazardous ingredients

Fuels, diesel

### Additional information

Refer to any national measures that may be relevant.

## 16. OTHER INFORMATION

Hazardous concentrations of hydrogen sulphide (H<sub>2</sub>S) gas can accumulate in storage and rundown tanks, marine vessel compartments, sump pits or other confined spaces. When opening valves, hatches and dome covers, stand upwind, keep face as far from the opening as possible and avoid breathing any gases or vapours. When exposure concentrations are unknown and respiratory protection is not used, personal H<sub>2</sub>S warning devices should be worn. These devices should not be relied on to warn of life threatening concentrations. H<sub>2</sub>S fatigues the sense of smell rapidly. The rotten egg odour of H<sub>2</sub>S disappears quickly, even though high concentrations are still present. The ACGIH TLV/TWA for H<sub>2</sub>S is 10 ppm, the STEL 15 ppm. The company recommends that all exposures to this product be minimized by strictly adhering to recommended occupational control procedures to avoid any potential adverse health effects.

All information contained in this Material Safety Data Sheet and, in particular, the health and safety and environmental information is accurate to the best of our knowledge and belief as at the date of issue specified. However, the Company makes no warranty or representation, express or implied, as to the accuracy or completeness of such information.

The provision of this Material Safety Data Sheet is not intended, of itself, to obviate the need for all users to satisfy themselves that the product described is suitable for their individual purposes and that the safety precautions and environmental advice are adequate for their individual purposes and situation. Further, it is the user's obligation to use this product safely and to comply with all applicable laws and regulations concerning the use of the product.

The company accepts no responsibility for any injury, loss or damage, consequent upon any failure to follow the safety and other recommendations contained in this Material Safety Data Sheet, nor from any hazards inherent in the nature of the material, nor from any abnormal use of the material.

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# SAFETY DATA SHEET - PentoMag 2000

(according to 2001/58/EC)

3

## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Identification of the substance/preparation: PentoMag 2000 - additive

Use of the substance/preparation: combustion optimisation in fuel oil fired power plants

Company/undertaking identification: PENTOL GmbH  
Degussaweg 1  
D-79639 Grenzach-Wyhlen  
Germany

Phone: +49 7624 300-0  
Fax: +49 7624 300-190  
E-Mail: office.d@pentol.net

Emergency phone: PENTOL GmbH, Laboratory

Mobile: +49 160 97819245

## 2. COMPOSITION / INFORMATION ON INGREDIENTS

General description: mixture of magnesium compounds in organic carrier substance

### Dangerous Ingredients:

CAS No	Substance	Content	Symbol letter/s	R phrase/s
68476-34-6	gasoil	< 20 %	Xn	40, 65

R 40 = Limited evidence of a carcinogenic effect. / R 65 = Harmful: may cause lung damage if swallowed.

## 3. HAZARDS IDENTIFICATION

Symbol letter/s: Xi (irritant)

Hazards identification: R 36/38 Irritating to eyes and skin.

## 4. FIRST AID MEASURES

Special means that must be available at the workplace: None.

General information: None.

After skin contact: Immediately remove contaminated clothes. Remove product with dry cloth. Wash with plenty of water for at least 10 minutes.

After eye contact: Remove product with dry cloth. Rinse with water for at least 10 minutes with eyelids held open.  
Seek medical advice immediately!

After inhalation: Not applicable; product does not release vapours.

After ingestion: Rinse mouth and drink plenty of water.  
Seek medical advice immediately!

Notes for physician: Product contains magnesium oxide.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: CO<sub>2</sub>, foam, extinguishing powder, sand or water spray.

Extinguishing media which must not be used for safety reasons: n. a.

Annotations:  
First issue/by:  
Latest up-date on/by:  
Up-dates see headings:

n. a. = not applicable / n. d. a. = no data available  
07.10.2005 / RW / CN  
/

# SAFETY DATA SHEET – PentoMag 2000

(according to 2001/58/EC)

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**Special exposure hazards:** Evaporated product is heavier than air and, therefore, sinks to the ground. Even distant sources of ignition may be an origin of danger.

**Special protective equipment for fire-fighters:** Wear suitable chemical protection clothing and self-contained breathing apparatus.

**Additional remarks:** Cool container with spray water from a safe distance. Condensate exhausting vapours with water. Prevent fire-fighting water from entering surface water or ground water.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions:** Avoid contact with product. Leaking product causes a great slip risk.

**Environmental precautions:** Avoid entry into sewerage system or soil.  
If product enters surface waters, drain networks or the underground, inform relevant authorities.

**Methods for cleaning up:** Contain and adsorb carefully with suitable material (sand, diatomite or absorber). Ensure correct disposal.

**Additional remarks:** n. a.

## 7. HANDLING AND STORAGE

**Specific use:**

Description: combustion optimisation in fuel oil fired power plants  
(for details see data sheet and/or label)

**Handling:**

Remarks on safe handling: n. a.

Remarks on fire and explosion protection: n. a.

**Storage:**

Specific design for storage rooms or containers: Store product in tightly closed original container and inaccessible for unauthorised persons.  
Make sure that storing area is furnished with good aeration and a floor coating which is adapted to the components.  
Store in accordance with national and regional regulations!  
Protect from heat and sunlight.

Incompatible materials: Do not store together with strong oxidising substances (danger of self-ignition).

Additional remarks on storage conditions: Store under cool and dry conditions, but at temperatures above pour point (pour point -10 °C).

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Additional remarks on design of technical equipment:** n. a.

**Substances with occupational exposure limit values:**

CAS No	Substance	Type of limit value	Value	Unit
68476-34-6	gasoil	MAC	n. d. a.	

# SAFETY DATA SHEET – PentoMag 2000

(according to 2001/58/EC)

3

## Personal protection:

### Protection and hygienic measures:

Do not eat, drink or smoke while working.  
Keep product away from food, drinks and animal food.  
Remove contaminated clothes immediately.  
Before rest periods and after having finished work, wash hands.  
Avoid contact with eyes and skin.

### Respiratory protection:

Not required if used as intended.

### Eye protection:

At least full vision glasses made of PC, better face protection shield made of PC.

### Hand protection:

Protective gloves with cuff. Suitable materials:

polychloroprene - CR (0.5 mm),  
butyl rubber - butyl (0.5 mm),  
fluoro rubber - FPM (0.4 mm),  
polyvinyl chloride - PVC (0.5 mm).

Degree of resistance and time of use have to be clarified with the supplier of the protective equipment.

### Skin protection:

Chemical protection overalls made of PE-HD or PP and safety boots made of PP or PE.

Degree of resistance and time of use have to be clarified with the supplier of the protective equipment.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### Appearance/physical state:

liquid slurry

### Colour:

brown-grey

### Odour:

initially slight gasoil odour

### Melting point/range:

n. d. a.

### Boiling point/range:

n. a.

### Flash point:

> 70 °C (closed cup)

> 112 °C (open cup)

### Flammability:

n. a.

### Explosion risk:

n. a.

### Ignition properties:

danger of fire when in contact with strong oxidising substances

### Vapour pressure at 20 °C:

< 2 mbar

### Density at 20 °C:

> 1.68 g/cm<sup>3</sup>

### Solubility in/miscibility with water at 20 °C:

insoluble

### pH at 20 °C:

n. a.

### Distribution coefficient (n-Octanol/water):

n. d. a.

### Viscosity (static, Brookfield) at 20 °C:

> 600 cP

## 10. STABILITY AND REACTIVITY

### Conditions to avoid:

None.

### Materials to avoid:

Avoid contact with the following substances: strong oxidising substances (risk of self-ignition).

### Hazardous decomposition products:

None.

Annotations:

First issue/by:

Latest up-date on/by:

Up-dates see headings:

n. a. = not applicable / n. d. a. = no data available

07.10.2005 / RW / CN

/

# SAFETY DATA SHEET - PentoMag 2000

(according to 2001/58/EC)

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## 11. TOXICOLOGICAL INFORMATION

**Acute toxicity:** n. d. a.

### Further toxicological details:

Effects of inhalation: n. a.

Effects of ingestion: None.

Effects on eyes: Irritating.

Effects on skin: Irritating.

Sensitisation: None.

Carcinogenicity: None.

Mutagenicity and reproductive toxicity: None.

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity:** Must not enter into waters, waste water or soil.  
Dangerous to drinking water.  
Aquatic toxicity: 50 - 500 mg/l.

**Mobility:** n. d. a.

**Persistence and degradability:** Product is not biodegradable.

**Bioaccumulative potential:** Gasoil may accumulate in organisms.

**Other adverse effects:** Unknown.  
Product is free of AOX and VOC.

## 13. DISPOSAL CONSIDERATIONS

### Product:

Recommendation: Disposal in accordance with national and regional regulations.

### Contaminated packaging:

Recommendation: Disposal in accordance with national and regional regulations.

### Other information:

Waste codes: Please refer to local waste registers and/or the European List of Wastes.

## 14. TRANSPORT INFORMATION

### Road and rail transport (ADR/RID):

ADR/RID class / packing group: Not hazardous as per ADR/RID.

Label:

Hazard identification number:

UN number:

Description of goods:

Annotations: n. a. = not applicable / n. d. a. = no data available  
First issue/by: 07.10.2005 / RW / CN  
Latest up-date on/by: /  
Up-dates see headings:

# SAFETY DATA SHEET - PentoMag 2000

(according to 2001/58/EC)

3

## Sea transport (IMDG):

IMDG/GGVSee class / packing group:

Not hazardous as per IMDG.

Label:

UN number:

EMS number:

Marine pollutant:

Correct technical name:

## Air transport (ICAO/ IATA):

ICAO/IATA class / packing group:

Not hazardous as per ICAO/IATA.

Label:

UN number:

Correct technical name:

## 15. REGULATORY INFORMATION

**Letter symbol/s and hazard description according to EC Directives:**

R phrases:

R 36/38

Irritating to eyes and skin.

S phrases:

S 24/25

Avoid contact with skin and eyes.

S 26

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 27/28

After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water and soap.

S 36/37/39

Wear suitable protective clothing, gloves and eye/face protection.

S 45

In case of accident or if you feel unwell, seek medical advice immediately (show safety data sheet or label where possible).

## National laws:

Flammability:

Not inflammable.

Water pollution class according to VwvWS / KBwS:

2 - hazardous to waters (self-classification).

Other regulations, restrictions and prohibitions:

The user of the product is responsible for gathering and respecting all national laws and all regulations established by local authorities.

Additional literature:

Ask your Accident Prevention Association or Insurance Company for their bulletins related to safe work with chemicals.

Annotations:  
First issue/by:  
Latest up-date on/by:  
Up-dates see headings:

n. a. = not applicable / n. d. a. = no data available  
07.10.2005 / RW / CN  
/

# SAFETY DATA SHEET – PentoMag 2000

(according to 2001/58/EC)

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## 16. OTHER INFORMATION

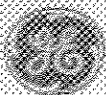
This safety data sheet is based on the regulations defined by the EU or by the Federal Republic of Germany if they are stricter. Possibly differing rules (e.g. limit values etc.) established by the recipient countries are not known to us. Should the case apply, they have to be clarified by the user of the product.

The above pieces of information are based on our present knowledge. However, they do neither represent a guarantee for the properties of the product nor found a legal relationship.

The working conditions on site are beyond our knowledge and control. The user of the product is responsible for respecting the legal requirements.

Annotations:  
First issue/by:  
Latest up-date on/by:  
Up-dates see headings:

n. a. = not applicable / n. d. a. = no data available  
07.10.2005 / RW / CN  
/



GE Betz

Version: 3.0  
Finalisation Date: 22/12/2003  
Previous Date: 10/04/2003

## SAFETY DATA SHEET

### FUELSOLV PEP990

## 1 IDENTIFICATION OF PREPARATION AND OF COMPANY

### 1.1 Identification of the substance or preparation

Product : FUELSOLV PEP990

### 1.2 Use of substance/preparation

Combustion catalyst for improving carbon burn out in fireside applications

### 1.3 Company/undertaking identification

GE Betz S.r.l.  
Strada Consortile, 7  
03013 FERENTINO (FR)  
Tel : +39/775/3911 +39/6/872711

### 1.4 Emergency telephone

+39/337/766363

## 2 COMPOSITION / INFORMATION ON INGREDIENTS

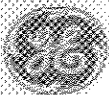
### Chemical description

Blend of dispersant and surfactants in light oil.

Hazardous component(s)	EINECS/ELINCS #	CAS #	Conc.
Sodium diisotridecyl sulphosuccinate Xi, R38-41	220-219-7	2673-22-5	< 20 %
Gas oil Xn,N, R40-65-66-51/53	-	N/A	30 - 60 %
Tall oil fatty acid, aminoethylethanolamine, imidazoline der. Xi, R36/38	272-902-4	68919-76-6	> 20 %
Nonyl phenol ethoxylate (>7-11 EO) Xn, R22-41-53	-	9016-45-9	20 - 25 %

### Remarks

The classification of the above substance(s) is given, including the symbol letters and R phrases which are assigned in accordance with their physicochemical, health and environmental hazards. Please refer to section 16 (Relevant R phrases, used in sections 2 and 3 of this SDS), where the full text of each relevant R phrase is listed.



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## SAFETY DATA SHEET

### FUELSOLV PEP990

#### 3 HAZARDS IDENTIFICATION

##### Important hazards

##### - Health/physical hazard

Further to the 22nd Adaptation to Technical Progress to EU directive 67/548, this product needs not to be classified with Risk phrase 65 as its kinetic viscosity is greater than  $7 \times 10^{-6} \text{ m}^2/\text{s}$   
Limited evidence of a carcinogenic effect.  
Irritating to skin.  
Risk of serious damage to eyes.

##### - Symptoms of exposure

Prolonged exposure may cause drying and cracking of skin.

##### - Environmental hazards

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

#### 4 FIRST AID MEASURES

##### Skin contact

Remove contaminated clothing.  
Wash thoroughly with soap and water.  
Seek medical attention.

##### Eye contact

Flush immediately with plenty of running water.  
Continue rinsing for at least 10 minutes.  
Seek medical attention.

##### Inhalation

Remove victim to fresh air and allow to rest.  
Seek medical attention.

##### Ingestion

First rinse mouth with water.  
Immediately give 1-2 glasses of water, if victim is fully conscious.  
Do NOT induce vomiting!  
Seek medical attention.

#### 5 FIRE-FIGHTING MEASURES

##### Extinguishing Media

##### - Suitable

Carbon dioxide, dry chemicals, foam.  
Avoid water if possible.

##### Special protective equipment for fire fighters

Self contained breathing apparatus (CEN : EN 137)  
Protective clothing (CEN : EN 469)  
Protective gloves (CEN : EN 659)  
Helmet (CEN : EN 443)

##### Special exposure hazards

Oxides of carbon, nitrogen and sulphur evolved in fire.

##### Flash point (PMCC)

67°C

#### 6 ACCIDENTAL RELEASE MEASURES

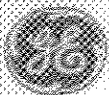
##### Personal precautions

Wear protective clothing, gloves and safety goggles.  
Please refer also to section no. 8 'Exposure controls' for further information.

##### Environmental precautions

Prevent from entering sewers or the immediate environment.  
Do not empty into drains, dispose of this material and its container to hazardous or special waste collection point.





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## SAFETY DATA SHEET

### FUELSOLV PEP990

#### Methods for Cleaning Up

- on soil Remove sources of ignition.  
Absorb onto inert material and dispose of according to Special Waste Regulations.  
Remove small spills with plenty of water.

## 7 HANDLING AND STORAGE

#### 7.1 Handling

Combustible.  
Do not use around sparks or flames.  
Earth containers during filling or discharge when performed at temperatures at or above the product flash point.

#### 7.2 Storage

Protect from freezing.  
Do not store at elevated temperatures.  
Store containers closed when not in use.

## 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Exposure controls

- Recommended engineering controls Ensure good ventilation.
- Respiratory protection In case of insufficient ventilation, use a breathing mask with filter type: A2-P2  
CEN : EN 136; EN 141
- Hand protection Neoprene gloves (Protection against unintentional short-term contact)  
CEN : EN 374-1/2/3; EN 420
- Eye protection Splash proof chemical goggles.  
CEN : EN 166
- Skin protection Protective clothing  
CEN : EN 340; EN 369; EN 465
- Environmental exposure controls Prevent from entering in public sewers or the immediate environment.  
Do not empty into drains, dispose of this material and its container to hazardous or special waste collection point.

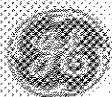
## 9 PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 General information

Appearance	Viscous liquid
Colour	Amber
Odour	Slight hydrocarbon

#### 9.2 Important health, safety and environmental info

pH in aqueous solution	10,8 (5% Emulsion)
Flash point (Pensky/Martens) (°C)	67
Density at 20°C (kg/m3)	910
Solubility in water (% weight)	Insoluble in water
Viscosity at 20°C (mPas)	70
Relative vapour density (air=1)	> 1
Evaporation rate (ether=1)	< 1



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## SAFETY DATA SHEET

### FUELSOLV PEP990

#### 9.3 Other information

Melting point, (°C) 10

## 10 STABILITY AND REACTIVITY

- |                                       |   |
|---------------------------------------|---|
| 10.1 Conditions to avoid              | Protect from freezing.                  |
| 10.2 Materials to avoid               | Avoid contact with strong oxidisers.    |
| 10.3 Hazardous decomposition products | Oxides of carbon, nitrogen and sulphur. |

## 11 TOXICOLOGICAL INFORMATION

#### Mammalian Test Data

- |                               |                          |
|-------------------------------|--------------------------|
| - Oral LD50, rat (mg/kg)      | > 2000 (estimated value) |
| - Dermal LD50, rabbit (mg/kg) | > 2000 (estimated value) |

#### Exposure hazard

- |                   |   |
|-------------------|---|
| - Inhalation      | May cause irritation to respiratory organs.<br>Prolonged exposure may cause dizziness and headache. |
| - Skin contact    | Causes irritation.<br>May cause dermatitis.   |
| - Eye contact     | Risk of serious damage to eyes.   |
| - Ingestion       | May cause slight gastrointestinal irritation.   |
| - Chronic effects | Limited evidence of a carcinogenic effect.  |

## 12 ECOLOGICAL INFORMATION

Ecotoxicity No data available

Persistence and degradability No data available

Summary Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.  
The evaluation of environmental hazards is based on the concentration limits as set out in directive 1999/45/EC.

## 13 DISPOSAL CONSIDERATIONS

Disposal of product According to Special Waste Regulations.

EWG ( European Waste Code ) recommendation : 13 08 02

13 Oil wastes and wastes of liquid fuels.

13 08 Oil wastes not otherwise specified.

13 08 02 Other emulsions.

Depending on the origin and state of the waste, other EWC numbers may be applicable too.



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## SAFETY DATA SHEET

### FUELSOLV PEP990

#### Disposal of packaging

According to Special Waste Regulations.

EWC ( European Waste Code ) recommendation : 15 01 10

15 Waste packaging: absorbents, wiping cloths, filter materials and protective clothing not otherwise specified.

15 01 Packaging (including separately collected municipal packaging waste).

15 01 10 Packaging containing residues of or contaminated by dangerous substances. Depending on the origin and state of the waste, other EWC numbers may be applicable too.

## 14 TRANSPORT INFORMATION

Substance Id.no. (SIN) (UN No.) 3082

Correct shipping name Environmentally hazardous substance, liquid, n.o.s.

- Contains Gas oil mixture

#### Land transport

- Transport hazard label 9  
Miscellaneous dangerous substances  
- RID/ADR classification 9  
- Packaging group III

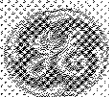
#### Maritime transport

- Transport hazard label 9  
Miscellaneous dangerous goods  
- IMO-IMDG class 9  
- Packaging group III  
- EmS no. F-A, S-F  
- MFAG no. See Emergency action guide.  
The treatment recommended in this Guide is specified in the appropriate tables and more comprehensive in the appropriate sections of the Appendices.

#### Air transport

- Transport hazard label 9  
Miscellaneous dangerous goods  
- ICAO/IATA classification 9

Other Information TREMCARD 90GM6-III



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Previous Date: 10/04/2003

## SAFETY DATA SHEET

### FUELSOLV PEP990

## 15 REGULATORY INFORMATION

#### EEC labelling information

- |                 |  |
|-----------------|--|
| - Symbol(s)     | Harmful: Xn<br>Dangerous for the environment: N  |
| - Contains      | Gas oil  |
| - R Phrase(s)   | R 38 : Irritating to skin.<br>R 40 : Limited evidence of a carcinogenic effect.<br>R 41 : Risk of serious damage to eyes.<br>R 51/53 : Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.   |
| - S Phrase(s)   | S 26 : In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.<br>S 28 : After contact with skin, wash immediately with plenty of soap and water.<br>S 36/37/39 : Wear suitable protective clothing, gloves and eye/face protection.<br>S 61 : Avoid release to the environment. Refer to special instructions/Safety data sheets. |
| - EINECS number | All ingredients of this product are listed in EINECS or ELINCS, unless specifically exempted under the EEC Directive 67/548/EEC.   |

## 16 OTHER INFORMATION

Nature of revision                      Correction in Section: 2,3,4,6,8,11,12,14,15

Based on EC Directive                1999/45/EC  
   2001/118/EC  
   2001/58/EC

This information is based on our current knowledge and is intended to describe the product for the purpose of safety requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

#### Relevant R phrases, used in sections 2 and 3 of this SDS

R 22 : Harmful if swallowed.  
R 38 : Irritating to skin.  
R 40 : Limited evidence of a carcinogenic effect.  
R 41 : Risk of serious damage to eyes.  
R 53 : May cause long-term adverse effects in the aquatic environment.  
R 65 : Harmful: may cause lung damage if swallowed.  
R 66 : Repeated exposure may cause skin dryness or cracking.  
R 36/38 : Irritating to eyes and skin.  
R 51/53 : Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

## Safety data for sodium hydroxide

Safety data for sodium hydroxide

Safety (MSDS) data for sodium hydroxide

### General

Synonyms: caustic soda, soda lye, lye, white caustic, sodium hydroxide, photofoil

etchant, NAOH, STCC 4935235, sodium hydroxide pellets, Lewis red devil lye

Molecular formula: NaOH

CAS No: 1310-73-2

EC No: 215-185-5

### Physical data

Appearance: odourless white solid (often sold as pellets)

Melting point: 318 C

Boiling point: 1390 C

Vapour density:

Vapour pressure: 1 mm Hg at 739 C

Specific gravity: 2.12

Flash point: n/a

Explosion limits: n/a

Autoignition temperature:

Water solubility: High (Note: dissolution in water is highly exothermic)

### Stability

Stable. Incompatible with a wide variety of materials including many metals,

ammonium compounds, cyanides, acids, nitro compounds, phenols, combustible

organics. Hygroscopic. Heat of solution is very high and may lead to a

dangerously hot solution if small amounts of water are used.

### Toxicology

Very corrosive. Causes severe burns. May cause serious permanent eye damage.

Very harmful by ingestion. Harmful by skin contact or by inhalation of dust.

Typical TLV 2 mg m<sup>-3</sup>.

### Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)

IPR-MUS LD50 40 mg kg<sup>-1</sup>

### Irritation data

(The meaning of any abbreviations which appear in this section is given here.)

EYE-MKY 1%/24h sev

SKN-RBT 500 mg/24h sev

## Safety data for sodium hydroxide

EYE-RBT 1% sev

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)

R35.

Transport information

(The meaning of any UN hazard codes which appear in this section is given

here.)

UN Major hazard class 8.0. Packing group II. UN No 1823. EMS No 8.0-06.

Personal protection

Safety glasses, adequate ventilation, Neoprene or PVC gloves.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)

S26 S37 S39 S45.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.

]

This information was last updated on September 1, 2003. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

## Sodium Bicarbonate

### Material Safety Data Sheet

**Chemical:** Sodium Bicarbonate

NFPA: H=1 F=0 I=0 S=None

HMIS: H=1 F=0 R=0 PPE= Supplied by user;  
dependent on conditions

**MSDS Number:** Bicarb-0604

**Effective Date:** 30 June 2004

**Issued by:** Solvay Chemicals, Inc. Regulatory Affairs Department

**Not valid three years after effective date or after issuance of superseding MSDS, whichever is earlier.** French or Spanish translations of this MSDS may be available. Check [www.solvaychemicals.us](http://www.solvaychemicals.us) or call Solvay Chemicals, Inc. to verify the latest version or translation availability.

Material Safety Data Sheets contain country-specific regulatory information; therefore, the MSDS's provided are for use only by customers of Solvay Chemicals, Inc. in North America. If you are located in a country other than Canada, Mexico or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location.

## 1. Company and Product Identification

**1.1 Product Name:** Sodium Bicarbonate

**Chemical Name:** Sodium hydrogen carbonate

**Synonyms:** Bicarb, baking soda, bicarbonate, sodium acid carbonate

**Chemical Formula:**  $\text{NaHCO}_3$

**Molecular Weight:** 84.02

**CAS Number:** 144-55-8

**EINECS Number:** 205-633-8

**1.2 Recommended Uses:** Animal feed, pharmaceuticals, purifying flue gas, chemical industry

**1.3 Supplier:** Solvay Chemicals, Inc.  
PO BOX 27328 Houston, TX 77227-7328  
3333 Richmond Ave. Houston, Texas 77098

**1.4 Emergency Telephone Numbers**

**Emergencies (USA):** 1-800-424-9300 (CHEMTREC®)

**Transportation Emergencies (INTERNATIONAL/MARITIME):** 1-703-527-3887 (CHEMTREC®)

**Transportation Emergencies (CANADA):** 1-613-996-6666 (CANUTEC)

**Transportation Emergencies (MEXICO-SETIQ):** 01-800-00-214-00 (MEX. REPUBLIC)  
525-559-1588 (Mexico City and metro area)



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Solvay  
Chemicals

Interox, Fluorides & Minerals



# Sodium Bicarbonate

## Material Safety Data Sheet

### 2. Composition/Information on Ingredients

INGREDIENTS	FORMULA	WT. PERCENT	CAS #
Sodium Bicarbonate	$\text{NaHCO}_3$	> 99	144-55-8

### 3. Hazards Identification

**Emergency Overview:** Sodium bicarbonate is an odorless, white crystalline solid, slightly to moderately irritating to mucous membranes and eyes.

**3.1 Route of Entry:** Inhalation: Yes Skin: Yes Ingestion: Yes

**3.2 Potential Effects of exposure:**

**Inhalation (Dust):** Slight irritating to nose.

**Eyes(Dust):** Moderate irritation to eyes.

**Skin contact:** Negligible effect.

**Ingestion:** Ingestion of large quantities may cause nausea and vomiting.

**Carcinogenicity:** See section 11.3.

### 4. First-Aid Measures

**General Recommendations:** Remove subject from exposure.

**4.1 Inhalation:** Remove subject to a dust free environment and blow nose.

**Eyes:**

- Flush eyes with running water for 15 minutes, maintaining the eyelids wide open to eliminate the product.
- Consult an ophthalmologist in case of persistent pain.

**Skin:**In case of persistent pain or reddening, consult a physician. Provide clean clothes.

**Ingestion:**

- DO NOT ATTEMPT TO GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.
- Rinse mouth with fresh water. Remove any residue of the product from the person's mouth.

### 5. Fire-Fighting Measures

**5.1 Flash point:** Not applicable.

**5.2 Auto-ignition Temperature:** Not applicable.

**5.3 Flammability Limits:** Not applicable.

**5.4 Unusual Fire and Explosion Hazards:** None.

**5.5 Extinguishing Methods**

**Common:** In case of fire in close proximity, all means of extinguishing are acceptable.

**Inappropriate extinguishing means:** No restriction.



## Sodium Bicarbonate

### Material Safety Data Sheet

## 6. Accidental Release Measures

### 6.1 Precautions:

- Avoid excessive dust.
- Follow the protective measures given in section 8.

### 6.2 Cleanup methods:

- Clean up uncontaminated material and recycle into process.
- Place unusable material into a dry, closed, labeled container compatible with the product.

### 6.3 Precautions for protection of the environment:

- Clean up residual material by washing area with water.
- Do not flush to drain.
- Prevent material from entering public sewer systems or any waterways.
- Dispose of waste in accordance with applicable federal, state, and local environmental laws and regulations.

## 7. Handling and Storage

**7.1 Handling:** Keep away from reactive products (See section 10).

**7.2 Storage:** Keep in a closed, properly labeled container in a dry area away from acids

**7.3 Specific Uses:** See Section 1.2.

**7.4 Other precautions:** None.

### 7.5 Packaging:

- Paper+PE.
- PE.

## 8. Exposure Controls/Personal Protection

**8.1 Exposure Limit Values:** This material does not have established exposure limits.

### Authorized limit Values

Nuisance Dust

### OSHA PEL

5 mg/m<sup>3</sup> (Respirable Fraction),  
15 mg/m<sup>3</sup> (Total Dust).

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.

### 8.2 Exposure Controls:

#### 8.2.1 Occupational Exposure Controls:

**8.2.1.1 Ventilation:** In places with the possibility for creating excessive dust in excess of exposure limits, ventilation should be provided.

**8.2.1.2 Respiratory protection:** In case of significant or accidental dust emissions, a NIOSH/MSHA approved dust respirator should be worn.

**8.2.1.3 Hand protection:** Chemical resistant gloves - for frequent or prolonged operations.

## Sodium Bicarbonate

### Material Safety Data Sheet

**8.2.1.4 Eye protection:** In cases of significant dust, dust proof goggles are recommended.

**8.3 Other precautions:**

- Protective clothing in dusty areas.
- An eyewash and safety shower should be nearby and ready for use.
- Use good hygiene practices when handling this product including changing work clothes after use.
- Do not eat, drink or smoke in areas where this material is handled.

## 9. Physical and Chemical Properties

**9.1 Appearance:** Crystalline solid.

**Color:** White.

**Odor:** Odorless.

**9.2 Important Health, Safety and Environmental information:**

**pH:** 8.6 (5% solution).

**Change of state:**

Melting point: Not Applicable.

Boiling point: Not Applicable (Decomposition).

Decomposition Temperature: Beginning at 60°C (140°F).

**Flash Point:** Not Applicable.

**Flammability:** Not Applicable.  
(solid, gas)

**Explosive Properties:** Not Applicable.

**Oxidizing Properties:** Non-Oxidizer.

**Vapor Pressure:** Not Applicable.

**Relative Density:** 2.2.

**Specific gravity (H<sub>2</sub>O=1)**

**Solubility:**

Water: 88g / liter water. @ 20°C( 68°F).

Fat: Not Applicable.

Alcohol: Slightly soluble.

**Partition coefficient:** P (n-octanol/water): Not applicable.

**Viscosity:** Not applicable.

**Vapor Density (air=1):** Not applicable.

**Evaporation Rate:** Not applicable.

**9.3 Other Information:**

**Bulk Density:** 32-79 lbs/ft<sup>3</sup> (0.5-1.2 kg/Dm<sup>3</sup>) - Typically 60 lbs/ft<sup>3</sup>

## Sodium Bicarbonate

### Material Safety Data Sheet

#### 10. Stability and Reactivity

**Stability:** Stable at ambient temperature and atmospheric pressure.

**10.1 Conditions to avoid:** Heat.

**10.2 Materials and substances to avoid:** Acids.

**10.3 Hazardous decomposition products:** None.

**10.4 Hazardous Polymerization:** Will not occur.

#### 11. Toxicological Information

**11.1 Acute toxicity:**

**Inhalation:** LC<sub>50</sub>, rat, >4.74mg/l.

**Oral:** LD<sub>50</sub>, rat, >4g/kg.

**Dermal:** No data.

**Irritation:**

- Rabbit, Slight irritant (skin).
- Rabbit, Slight irritant (eyes).

**11.2 Chronic toxicity:**

- No observed effect.
- In vitro, no mutagenic effect.
- Oral route (gavage), 10 days, various species, 330 mg/kg, no teratogenic effect.

**11.3 Carcinogenic Designation:** None.

#### 12. Ecological Information

**12.1 Acute ecotoxicity:**

- Crustaceans, Daphnia magna, EC<sub>50</sub>, 48 hours, 4100 mg/l.
- Crustaceans, Daphnia magna, NOEC, 48 hours, 3100 mg/l.
- Fishes, Lepomis macrochirus, LC<sub>50</sub>, 96 hours, 7100 mg/l.
- Fishes, Lepomis macrochirus, NOEC, 96 hours, 5200 mg/l.
- Fishes, Oncorhynchus mykiss, LC<sub>50</sub>, 96 hours, 7700 mg/l.
- Fishes, Oncorhynchus mykiss, NOEC, 96 hours, 2300 mg/l.

**12.2 Chronic ecotoxicity:** No data.

**12.3 Mobility:**

- Water: Considerable solubility and mobility.
- Soil/sediments: Considerable solubility and mobility.

## Sodium Bicarbonate

### Material Safety Data Sheet

#### 12.4 Degradation

##### Abiotic:

- Water, hydrolysis. Acid/Base equilibrium as a function of pH.
- Degradation products: carbonic acid/carbon dioxide (pH<6) /bicarbonate (pH 6-10)/carbonate (pH>10) Soil-result: Not applicable (inorganic compound).

**Biotic:** Not Applicable (inorganic compound).

**12.5 Potential for bioaccumulation:** Not Applicable (inorganic compound).

**12.6 Other adverse effects /Comments:** Product is not significantly hazardous for the environment.

#### 13. Disposal Considerations

**13.1 Waste treatment:** Sodium Bicarbonate is not a listed hazardous waste under 40 CFR 261. However, state and local regulations for waste disposal may be more restrictive. Spilled product should be disposed of in an EPA approved disposal facility in accordance with applicable national, state and local environmental laws and regulations.

**13.2 Packaging treatment:** Use dedicated containers where possible. Rinse the empty containers and treat the effluent in the same way as waste. Consult current federal, state and local regulations regarding the proper disposal of emptied containers.

**13.3 RCRA Hazardous Waste:** Not Listed.

#### 14. Transport Information

Mode	DOT	IMDG	IATA
UN Number	Not a regulated hazardous material.	Not a regulated hazardous material.	Not a regulated hazardous material.
Other	It is recommended that ERG Guide # 111 be used for all non-DOT-regulated material.		

#### 15. Regulatory Information

##### National Regulations (US)

**TSCA Inventory 8(b):** Yes.

**SARA Title III Sec. 302/303 Extremely Hazardous Substances (40 CFR355):** No.

**SARA Title III Sec. 311/312 (40 CFR 370):** No.

**SARA Title III Sec. 313 Toxic Chemical Emissions Reporting (40 CFR 372):** No.

##### CERCLA Hazardous Substance (40 CFR Part 302)

Listed: No.

Unlisted Substance: No.

Characteristic: Not Applicable.

**State Component Listing:** None identified.

## Sodium Bicarbonate

### Material Safety Data Sheet

#### National Regulations (Canada)

**Canadian DSL Registration:** Yes.

**WHMIS Classification:** Not listed.

This product has been classified in accordance with the hazard criteria of the **Controlled Products Regulations**, and the MSDS contains all the information required by the **Controlled Products Regulations**.

**ECC Labeling:** Not classified according to Annex I of Dir. 67/548/EEC (19th ATP: Dir. 93/72/EEC)

## 16. Other Information

### 16.1 Ratings:

#### NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

Health = 1    Flammability = 0    Instability = 0    Special = None

#### HMIS (HAZARDOUS MATERIAL INFORMATION SYSTEM)

Health = 1    Fire = 0    Reactivity = 0    PPE = Supplied by User; dependent on local conditions

### 16.2 Other Information:

Maximum Dose level for Potable water is 200 mg/l.

The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product).

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### 16.3 Reason for revision:

Supersedes edition: None.

Purpose of revision: Original.



GE Betz

Version: 5.0  
Finalisation Date: 31/03/2003  
Previous Date: 05/12/2002

## SAFETY DATA SHEET

### CORTROL OS5009

## 1 IDENTIFICATION OF PREPARATION AND OF COMPANY

### 1.1 Identification of the substance or preparation

Product : CORTROL OS5009

### 1.2 Use of substance/preparation

Organic oxygen scavenger

### 1.3 Company/undertaking identification

GE Betz S.r.l.  
Strada Consortile, 7  
03013 FERENTINO (FR)  
Tel : +39/775/3911 +39/6/872711

### 1.4 Emergency telephone

+39/337/766363

## 2 COMPOSITION / INFORMATION ON INGREDIENTS

### Chemical description

Aqueous solution of hydroquinone and amino compounds

Hazardous component(s)	EINECS/ELINCS #	CAS #	Conc.
N,N Diethylhydroxylamine Xn, R10-20/21-36/37/38	223-055-4	3710-84-7	< 20 %
Cyclohexylamine C, R10-21/22-34	203-629-0	108-91-8	2 - 10 %
Morpholine C, R10-20/21/22-34	203-815-1	110-91-8	1 - 10 %
Sodium hydroxide C, R35	215-185-5	1310-73-2	0.5 - 2 %
Hydroquinone Xn, N, R22-40-68-41-43-50	204-617-8	123-31-9	0.1 - 1 %

### Remarks

The classification of the above substance(s) is given, including the symbol letters and R phrases which are assigned in accordance with their physicochemical, health and environmental hazards. Please refer to section 16 (Relevant R phrases, used in sections 2 and 3 of this SDS), where the full text of each relevant R phrase is listed.

## 3 HAZARDS IDENTIFICATION

### Important hazards

- |                          |   |
|--------------------------|---|
| - Health/physical hazard | Causes burns.   |
| - Environmental hazards  | The product is not classified as dangerous for the environment. |



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## SAFETY DATA SHEET

### CORTROL OS5009

#### 4 FIRST AID MEASURES

<b>Skin contact</b>	Wash immediately with plenty of water. Immediately remove all contaminated clothing. Seek medical attention.
<b>Eye contact</b>	Flush immediately with plenty of running water. Keep eyelids apart. Seek medical attention.
<b>Inhalation</b>	Remove patient to fresh air, allow to rest and keep warm. Seek medical attention.
<b>Ingestion</b>	Rinse mouth with water. Do NOT induce vomiting! Seek medical attention.

#### 5 FIRE-FIGHTING MEASURES

<b>Extinguishing Media</b>	
- Suitable	Water, foam, carbon dioxide.
<b>Special protective equipment for fire fighters</b>	Self contained breathing apparatus. (CEN : EN 137) Protective clothing (CEN : EN 469) Protective gloves (CEN : EN 659) Helmet (CEN : EN 443)
<b>Special exposure hazards</b>	Exposure to high temperatures may cause evaporation, creating a flammable concentrate and vapour. Oxides of carbon and nitrogen evolved in fire.
<b>Flash point (PMCC)</b>	57 °C

#### 6 ACCIDENTAL RELEASE MEASURES

<b>Personal precautions</b>	Wear protective clothing, gloves and safety goggles. Please refer also to section no. 8 'Exposure controls' for further information.
<b>Environmental precautions</b>	Prevent from entering sewers or the immediate environment. Accidental release of large quantities into the aquatic environment may harm aquatic organisms.
<b>Methods for Cleaning Up</b>	
- on soil	Absorb onto inert material and dispose of according to Special Waste Regulations. Clean with water.

#### 7 HANDLING AND STORAGE

<b>7.1 Handling</b>	Do not breathe vapours. Avoid contact with skin and eyes.
<b>7.2 Storage</b>	Keep container tightly closed. Store in cool, well ventilated area.

#### 8 EXPOSURE CONTROLS/PERSONAL PROTECTION



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## SAFETY DATA SHEET

### CORTROL OS5009

#### Exposure limit values

- MAC  
Cyclohexylamine: MAC-TGG 5 ppm, 20 mg/m<sup>3</sup> (8h) Sk  
Morpholine: MAC-TGG 10 ppm, 36 mg/m<sup>3</sup> (8hr), 20 ppm, 72 mg/m<sup>3</sup> (15min), Sk  
Sodium hydroxide: MAC-TGG 2 mg/m<sup>3</sup> (8h) C  
Hydroquinone: MAC-TGG 2 mg/m<sup>3</sup> (8hr)

#### Exposure controls

- Recommended engineering controls Adequate ventilation to maintain air contaminants below exposure limits.
- Respiratory protection In case of insufficient ventilation, use a breathing mask with filter type: A3  
CEN : EN 140; EN 141
- Hand protection Gauntlet type neoprene gloves.  
CEN : EN 374-1/2/3; EN 420
- Eye protection Splash proof chemical goggles.  
Face shield.  
CEN : EN 166
- Skin protection Chemical resistant apron.  
CEN : EN 340; EN 368; EN 369; EN 467
- Environmental exposure controls Prevent from entering in public sewers or the immediate environment.

## 9 PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 General information

- Appearance Liquid
- Colour Colourless to pale yellow
- Odour Amine

#### 9.2 Important health, safety and environmental info

- pH in aqueous solution 11,6 ( 5% )
- Flash point (Pensky/Martens) 57  
(°C)
- Density at 20°C (kg/m<sup>3</sup>) 1005
- Solubility in water (% weight) Completely soluble
- Partition coefficient (Pow) (Refers to active component) ( Hydroquinone ): 0,59
- Viscosity at 20°C (mPas) 7,5 cPs.

#### 9.3 Other information

- Melting point, (°C) - 4
- Pour point, (°C) - 1

## 10 STABILITY AND REACTIVITY

- 10.1 Conditions to avoid Keep away from heat.
- 10.2 Materials to avoid Avoid contact with strong acids.
- 10.3 Hazardous decomposition products Oxides of carbon and nitrogen evolved in fire.





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## SAFETY DATA SHEET

### CORTROL OS5009

## 11 TOXICOLOGICAL INFORMATION

#### Mammalian Test Data

- Oral LD50, rat (mg/kg) > 2000 (estimated value)
- Dermal LD50, rabbit (mg/kg) > 2000 (estimated value)

#### Exposure hazard

- Inhalation Irritating to respiratory system.  
May cause nausea, dizziness and/or vomiting.
- Skin contact Causes burns.
- Eye contact Causes burns.
- Ingestion Causes burns in mouth, throat and/or stomach.  
Causes nausea, dizziness and/or vomiting.

## 12 ECOLOGICAL INFORMATION

**Ecotoxicity** No data available

#### Persistence and degradability

- COD (mgO<sub>2</sub>/g) 563 (calculated data)
- BOD 5 (mgO<sub>2</sub>/g) 10 (calculated data)
- BOD 28 (mgO<sub>2</sub>/g) 146 (calculated data)
- Closed Bottle Test (%) 28 (calculated data)
- Degradation in 28 days
- Zahn-Wellens Test (%) 44 (calculated data)
- Degradation in 28 days
- TOC (mg C/g) 129 (calculated data)
- Biodegradation (%) Testing has shown product to be readily biodegradable.  
(Refers to active component) Hydroquinone

#### Bioaccumulative potential

- Bioaccumulation (Refers to active component) ( Hydroquinone ): BCF : 40
- Partition coefficient (Pow) (Refers to active component) ( Hydroquinone ): 0,59

#### Other adverse effects

- Heavy metals None.
- Nutrients N = 38 mg/g

#### Summary

The product is not classified as dangerous for the environment.  
The evaluation of environmental hazards is based on the concentration limits as set out in directive 1999/45/EC.



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Finalisation Date: 31/03/2003  
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## SAFETY DATA SHEET

### CORTROL OS5009

#### 13 DISPOSAL CONSIDERATIONS

<b>Disposal of product</b>	According to Special Waste Regulations.  EWC ( European Waste Code ) recommendation : 16 03 05 16 Wastes not otherwise specified in the list. 16 03 Off-specification batches and unused products. 16 03 05 Organic wastes containing dangerous substances. Depending on the origin and state of the waste, other EWC numbers may be applicable too.
<b>Disposal of packaging</b>	According to Special Waste Regulations.  EWC ( European Waste Code ) recommendation : 15 01 10 15 Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified. 15 01 Packaging (including separately collected municipal packaging waste). 15 01 10 Packaging containing residues of or contaminated by dangerous substances. Depending on the origin and state of the waste, other EWC numbers may be applicable too.

#### 14 TRANSPORT INFORMATION

<b>Substance id.no. (SIN) (UN No.)</b>	2734
<b>Correct shipping name</b>	Amines, liquid, corrosive, flammable, n.o.s.
<b>- Contains</b>	Cyclohexylamine mixture N,N Diethylhydroxylamine mixture
<b>Land transport</b>	
- Transport hazard label	8 + 3 Corrosive Flammable
- RID/ADR classification	8
- Packaging group	II
<b>Maritime transport</b>	
- Transport hazard label	8+3 Corrosive Flammable.
- IMO-IMDG class	8
- IMO-IMDG page	8104
- Packaging group	II
- EmS no.	8-04
- MFAG no.	320
<b>Air transport</b>	
- Transport hazard label	8 + 3 Corrosive Flammable
- ICAO/IATA classification	8
<b>Other information</b>	TREMCARD 80GCF1-II



GE Betz

Version: 5.0  
Finalisation Date: 31/03/2003  
Previous Date: 05/12/2002

## SAFETY DATA SHEET

### CORTROL OS5009

## 15 REGULATORY INFORMATION

#### EEC labelling information

- Symbol(s)	Corrosive:C
- Contains	Cyclohexylamine Morpholine Hydroquinone : May produce an allergic reaction.
- R Phrase(s)	R 34 :Causes burns.
- S Phrase(s)	S 26 :In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S 28 :After contact with skin, wash immediately with plenty of water. S 36/37/39 :Wear suitable protective clothing, gloves and eye/face protection. S 45 :In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
- EINECS number	All ingredients of this product are listed in EINECS or ELINCS, unless specifically exempted under the EEC Directive 67/548/EEC.

## 16 OTHER INFORMATION

Nature of revision	Correction in Section: 1,2,3,5,6,8,11,12,13,14,15,16 Adaptation to new transport regulation 01.07.2001
Based on EC Directive	1999/45/EC 2001/58/EC 2001/118/EC  This information is based on our current knowledge and is intended to describe the product for the purpose of safety requirements only. It should not therefore be construed as guaranteeing any specific property of the product.
Relevant R phrases, used in sections 2 and 3 of this SDS	R 10 : Flammable. R 22 : Harmful if swallowed. R 34 : Causes burns. R 35 : Causes severe burns. R 40 : Limited evidence of a carcinogenic effect. R 41 : Risk of serious damage to eyes. R 43 : May cause sensitisation by skin contact. R 50 : Very toxic to aquatic organisms. R 68 : Possible risk of irreversible effects. R 20/21 : Harmful by inhalation and in contact with skin. R 20/21/22 : Harmful by inhalation, in contact with skin and if swallowed. R 21/22 : Harmful in contact with skin and if swallowed. R 36/37/38 : Irritating to eyes, respiratory system and skin.

# Safety (MSDS) data for sodium phosphate tribasic

## General

Synonyms: phosphoric acid trisodium salt, trisodium phosphate, sodium phosphate

Molecular formula:  $\text{Na}_3\text{PO}_4$

CAS No: 10101-89-0

EC No:

## Physical data

Appearance: white crystals

Melting point: ca. 75 °C (decomposes)

Boiling point:

Vapour density:

Vapour pressure:

Specific gravity: 1.62

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: soluble

## Stability

Stable. Incompatible with strong acids. Keep dry.

## Toxicology

Corrosive - causes burns. Avoid skin and eye contact.

### Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)

ORL-RAT LD50 7400 mg kg<sup>-1</sup>

### Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)

R34

## Personal protection

Safety glasses.

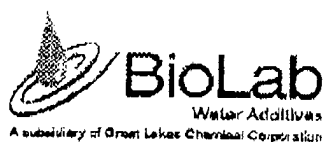
### Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)

S22 S26 S27 S36 S37 S39.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.](#)

This information was last updated on September 3, 2003. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.



## SAFETY DATA SHEET

### BELGARD EV2050

#### 1. IDENTIFICATION OF THE SUBSTANCE/ PREPARATION AND THE COMPANY:

PRODUCT NAME: BELGARD EV2050  
CHEMICAL NAME 2: Mixture of organic acids  
PART No.: 995, 6048, 1188  
SUPPLIER: BioLab Water Additives  
Tenax Road, Trafford Park,  
Manchester M17 1WT  
United Kingdom  
Tel: +44 (0)161 872 2323  
Fax: +44 (0)161 873 7271  
EMERGENCY TELEPHONES: +44 (0)161 848 9797

#### 2. COMPOSITION/ INFORMATION ON INGREDIENTS:

EEC (EINECS) No. Exempt  
COMPOSITION COMMENTS: Aqueous solution containing maleic acid copolymer, phosphino carboxylic acid and a phosphonic acid

#### 3. HAZARDS IDENTIFICATION

Irritating to eyes.

#### 4. FIRST AID MEASURES

INHALATION: Provide fresh air, warmth and rest, preferably in a comfortable upright sitting position. Get medical attention if any discomfort continues.  
INGESTION: DO NOT INDUCE VOMITING! Rinse mouth thoroughly. Get medical attention.  
SKIN: Immediately remove contaminated clothing. Rinse immediately with plenty of water. Continue to rinse for at least 15 minutes. Get medical attention if irritation persists after washing.  
EYES: Rinse the eye with water immediately. Continue to rinse for at least 15 minutes. Contact physician if irritation persists.

#### 5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Use: Water spray, fog or mist. Powder, foam or CO<sub>2</sub>.

**6. ACCIDENTAL RELEASE MEASURES****SPILL CLEANUP METHODS:**

Should be prevented from entering drains. Absorb in vermiculite, dry sand or earth and place into containers. Collect and reclaim or dispose in sealed containers in licensed waste. Containers with collected spillage must be properly labelled with correct contents and hazard symbol.

**7. HANDLING AND STORAGE****USAGE PRECAUTIONS:**

Avoid spilling, skin and eye contact.

**STORAGE PRECAUTIONS:**

Do NOT use container made of: Carbon steel.  
Store separated from: Alkalies, Reducing Agents.  
Keep containers tightly closed.  
Keep separate from food, feedstuffs, fertilizers and other sensitive material.  
Store at moderate temperatures in dry, well ventilated area.  
Protect from light, including direct sun rays.

**8. EXPOSURE CONTROLS AND PERSONAL PROTECTION****INGREDIENT COMMENTS:**

No exposure limits noted for ingredient(s).

**VENTILATION:**

No particular ventilation requirements.

**RESPIRATORS:**

Respiratory protection not required.

**PROTECTIVE GLOVES:**

Use protective gloves made of: Rubber, neoprene or PVC.

**EYE PROTECTION:**

Wear approved safety goggles.

**OTHER PROTECTION:**

Wear appropriate clothing to prevent repeated or prolonged skin contact.

**HYGIENIC WORK PRACTICES:**

No specific hygiene procedures noted, but good personal hygiene practices are always advisable, especially when working with chemicals.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>APPEARANCE:</b>	Liquid.		
<b>COLOUR:</b>	Amber.		
<b>ODOUR/TASTE:</b>	Slight.		
<b>BOILING POINT (°C, interval):</b>	100 - 102	<b>Pressure:</b>	
<b>MELT/FREEZ. POINT (°C, interval):</b>	<-5		
<b>DENSITY/SPECIFIC GRAVITY (g/ml):</b>	1.14 - 1.16	<b>Temperature (°C):</b>	20
<b>VAPOUR PRESSURE:</b>	17.5 mmHg	<b>Temperature (°C):</b>	20
<b>pH-VALUE, CONC. SOLUTION:</b>	<2		
<b>VISCOSITY (interval):</b>	9 - 15 cSt	<b>Temperature (°C):</b>	25
<b>SOLUBILITY DESCRIPTION:</b>	Miscible with water.		
<b>PARTITION COEFF. (log Pow):</b>	<3		

**10. STABILITY AND REACTIVITY****CONDITIONS TO AVOID:**

Reacts with alkalis and generates heat.

**11. TOXICOLOGICAL INFORMATION****TOXIC DOSE - LD 50:**

2400 mg/kg (oral rat)

**SKIN:**Non Irritant  
Not a Skin Sensitiser**EYES:**

Irritating to eyes.

**12. ECOLOGICAL INFORMATION****Ecotoxicological data**

Acute toxicity. LC50 96 hours fish &gt; 1000 mg/l Juvenile Turbot OECD 203

Acute toxicity. EC50 48 hours 471.5 mg/l Acartia Tonsa ISO 14669

Acute toxicity. EC50 48 hours algae 804.5 mg/l ISO 10253

**EC 50, 48 HRS, DAPHNIA, mg/l:**

&gt;1000

**IC 50, 72 HRS, ALGAE, mg/l:**

&gt;100

**DEGRADABILITY:**

Not inherently biodegradable

**13. DISPOSAL CONSIDERATIONS****DISPOSAL METHODS:**

INCINERATE.

Absorb in vermiculite or dry sand, dispose in licensed special waste.  
Liquid material should be incinerated. Material absorbed onto sand or earth should be disposed of as solid waste in accordance with local regulations. Empty packaging may contain product residues and due consideration should be given prior to disposal.**14. TRANSPORT INFORMATION****LABEL FOR CONVEYANCE:****UN No. ROAD:**

UN 3265

**ADR CLASS No.:**

8

**ADR CLASS:**

Class 8: Corrosive substances.



ADR ITEM No.: 40 (c)  
HAZARD No. (ADR): 80 Corrosive or slightly corrosive substance.  
ADR MARGINAL: 2801  
PROPER SHIPPING NAME I: Corrosive Liquid, Acidic, Organic, N.O.S., (contains polycarboxylic acids & a phosphonic acid)  
IMDG CLASS: 8  
IMDG PACK GR.: III  
EmS No.: 8-15  
MARINE POLLUTANT: No.  
ICAO CLASS: 8

**K. REGULATORY INFORMATION**

## LABEL FOR SUPPLY:



RISK PHRASES: R-36 Irritating to eyes.  
SAFETY PHRASES: S-26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.  
S-39 Wear eye/face protection.  
EU DIRECTIVES: Dangerous Substance Directive 67/548,  
Dangerous Preparations Directive 88/379.

**L. OTHER INFORMATION**

USER NOTES: Belgard EV2050 is certified by NSF International for use as an antiscalant in seawater distillation plants. The maximum approved dose level is 10 mg/l in the feedwater. Classified as corrosive class 8 for transportation on the basis of its effect on mild steel.  
ISSUED BY: A.F.S  
REVISION DATE: 01/01/01  
REV. No./REPL. SDS GENERATED: 1  
SAFETY DATA SHEET STATUS: Approved.  
DISCLAIMER: For safety reasons it is IMPERATIVE that customers:-  
1. Ensure that all those within their control who use the products are supplied with all relevant information contained within the Material Safety Data Sheet and Technical Bulletin concerning the applications for which the product is designed and any instructions and warnings contained therein.  
2. Consult BioLab Water Additives before using or supplying the product for any other applications.  
The information contained herein is based on the present state of our knowledge and is intended to describe our products from the point of view of safety requirements. It should not therefore be construed as guaranteeing specific properties.

## Belgard® EV2050

Antiscalant and antifoulant for single and multiple effect spray film evaporators

December 1988

EV2050gpi

### General Product Information

Belgard EV2050 is a high performance liquid product for the control of scaling and particulate fouling in both single and multiple effect spray film evaporators. It is a multifunctional product based on polycarboxylic acid chemistry.

Belgard EV2050, with its enhanced scale control and dispersant properties is designed to give improved control of fouling throughout the plant, reducing cleaning frequencies and the associated costs.

Belgard EV2050 is particularly effective against calcium carbonate scales frequently encountered in spray film evaporators and has the additional feature of excellent dispersant activity against potential foulants suspended in the brine film. Calcium sulphate scale formation is normally prevented by avoiding supersaturation through control of brine concentration and temperature. Belgard EV2050 will give protection against calcium sulphate deposition in the event of any operating parameter excursions into the calcium sulphate supersaturation region.

Belgard EV2050 is certified to ANSI/NSF Standard 60 for use in distillation plants producing potable water.

### Product Properties

The following are typical properties of Belgard EV2050 and should not be regarded as specification limits for the product. A product specification is available on request.

appearance	pale yellow liquid
odour	slight
	< 2
solids content	33 to 37% w/w
specific gravity at 20/20°C	1.13 to 1.18
boiling point range	101 - 103°C
freezing point range	0 to -10 °C

### Thermal Stability

Thermogravimetric analysis and differential scanning calorimetry show Belgard EV2050 to be stable up to a temperature of 200°C.

### Chemical Reactivity

Belgard EV2050 is not affected by chlorine or other oxidising biocides under normal conditions of use.

### Application and Dose Level

Belgard EV2050 is an aqueous solution an organic acid and as such is corrosive in its concentrated form. Corrosion resistant dosing equipment must be used, for example 316L stainless steel or plastics such as GRP, PVC or PE. In use Belgard EV2050 is immediately neutralised by the alkalinity in the recycle brine and will not contribute to the corrosion of plant materials of construction.

Belgard EV2050 is miscible with water in all proportions. It may be applied as the neat product, or as a solution in distillate and should be dosed continuously, and proportionately to the seawater make-up flow, to maintain the recommended dose level.

The injection point may be into the make-up line after any external de-aeration equipment. In the case of multiple-effect units additional benefit may be obtained from "split product" dosing. Additional details and recommendations are available on request.

The dose level required will depend on a number of factors, including the quality of the feed, effect temperatures and concentration factors. Typical dose levels will be in the range 2 to 5 mg/l. Detailed dose level recommendations are available on request.

### Health and Safety

From the results of acute studies Belgard EV2050 is classed as non toxic. A Material Safety Data Sheet is available on request.

### Regulatory

Belgard EV2050 is certified to ANSI/NSF Standard 60 for use in seawater distillation plants producing potable water.

### Logistics

classification	corrosive for conveyance irritant for supply
packaging	HDPE 220L XL-ring Mauser drum 932x580 mm height x diameter net weight 230 kg gross weight 238.5 kg

Belgard EV2050 is also available in bulk, semi-bulk and 25 kg net containers. Details are available on request.

# Safety (MSDS) data for sulfuric acid (concentrated)



## General

Synonyms: oil of vitriol, mattling acid, vitriol, battery acid, dipping acid, electrolyte acid, vitriol brown oil, sulphuric acid

Molecular formula:  $\text{H}_2\text{SO}_4$

CAS No: 7664-93-9

EC No: 231-639-5

EC index No: 016-020-00-8

## Physical data

Appearance: Colourless oily liquid

Melting point: -2 °C

Boiling point: 327 °C

Specific gravity: 1.84

Vapour pressure: <0.3 mm Hg at 20 °C (vapour density 3.4)

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: miscible in all proportions

## Stability

Stable. Substances to be avoided include water, most common metals, organic materials, strong reducing agents, combustible materials, bases, oxidising agents.

**Reacts violently with water - when diluting concentrated acid, carefully and slowly add acid to water, not the reverse. Reaction with many metals is rapid or violent, and generates hydrogen (flammable, explosion hazard).**

## Toxicology

**Extremely corrosive, causes serious burns. Highly toxic. Harmful by inhalation, ingestion and through skin contact. Ingestion may be fatal. Skin contact can lead to extensive and severe burns. Chronic exposure may result in lung damage and possibly cancer.**

### Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)

IHL-RAT LC50 0.51 mg/l

UNR-MAN LDLO 135 mg kg<sup>-1</sup>

ORL-RAT LD50 2140 mg kg<sup>-1</sup> (25% solution)

IHL-MUS LC50 320 mg m<sup>-3</sup> / 2h

IHL-GPG LC50 18 mg m<sup>-3</sup>

### Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)

R35 R36 R37 R38 R49.

## Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)

UN No 1830. IMDG class 8. Packing group II. IATA 1830. UK transport category 2.

## Personal protection

Safety glasses or face mask; acid-resistant gloves. Suitable ventilation. In the UK use of this material must be assessed under the COSHH regulations.

### Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)

S23 S30 S36 S37 S39 S45.

[Return to [Physical & Theoretical Chemistry Lab](#) Safety home page.]

This information was last updated on September 3, 2003. Although we have tried to make it as accurate and useful as possible, we can take no responsibility for its use or misuse.

# Safety (MSDS) data for sulfamic acid



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## General

Synonyms: amidosulfonic acid, amidosulfuric acid, sulfamidic acid, sulphamic acid

Molecular formula:  $\text{H}_3\text{NO}_3\text{S}$

CAS No: 5329-14-6

EC No: 226-218-8

## Physical data

Appearance: white crystals

Melting point: ca. 215 C (decomposes)

Boiling point:

Vapour density: 3.3

Vapour pressure:

Specific gravity: 2.11

Flash point:

Explosion limits:

Autoignition temperature:

## Stability

Stable.

---

## Toxicology

Corrosive. Harmful by ingestion. Skin and eye irritant.

### Toxicity data

ORL-RAT LD50 3160 mg kg<sup>-1</sup>

ORL-MUS LD50 1312 mg kg<sup>-1</sup>

ORL-GPG LD50 1050 mg kg<sup>-1</sup>

### Risk phrases

R36 R38.

## Transport information

UN Major hazard class: 8.0. Packing group: III. UN No: 2967.

## Personal protection

Safety glasses.

### Safety phrases

S26 S28.

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This information was last updated on September 4, 2003. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

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# MATERIAL SAFETY DATA SHEET



**BIOCAF 1320**

GRUPPO

SNIA

## 1. PRODUCT IDENTIFICATION AND COMPANY NAME

### 1.1 PRODUCT IDENTIFICATION

Chemical family: MIXTURE OF CHLORITES AND INORGANIC PEROXIDES  
 Trade names and synonyms: BIOCAF 1320  
 Chemical Abstract Name:  
 CAS Number:  
 EEC Number:  
 Empirical Formula:  
 Molecule Weight:  
 Structural Formula:

### 1.2 COMPANY NAME

Name: CAFFARO S.p.A. - Chemicals Business Unit - DAE Management  
 Address: 20031 CESANO MADERNO (MI) - Via Friuli, 55  
 Telephone: 0362/5141

### 1.3 HOT LINE

Consulting office: 0362-514716 SAFETY AND ENVIRONMENT PROTECTION SERVICE  
 SNIA - CHEMICAL GROUP

## 2. COMPOSITION-INGREDIENTS

Hazardous components	%	Classification	R phrases
ALKALINE CHLORITES	12-24	Xi (IRRITANT)	H 32 (CONTACT WITH ACIDS LIBERATES VERY TOXIC GAS)
			H 41 (RISK OF SERIOUS DAMAGE TO EYES)

## 3. HAZARD DATA

Health: RISK OF SERIOUS DAMAGES TO EYES.  
 Environment: CONTACT WITH ACIDS DEVELOPS CHLORINE DIOXIDE, A TOXIC AND EXPLOSIVE GAS. AVOID RELEASE TO THE ENVIRONMENT

## 4. FIRST AID

Eye contact: RINSE IMMEDIATELY WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. SEEK MEDICAL ADVICE.  
 Skin contact: WASH IMMEDIATELY OUT THE PRODUCT. FLUSH THE AFFECTED AREA WITH PLENTY OF WATER AND NEUTRAL SOAP.  
 If swallowed: LET THE VICTIM DRINK WATER TO DILUTE THE SUBSTANCE. DO NOT INDUCE VOMITING. IMMEDIATELY SEEK MEDICAL ADVICE.  
 Inhalation: REMOVE THE VICTIM TO FRESH AIR. IN CASE OF INHALATION OF CHLORINE DIOXIDE, IMMEDIATELY SEEK MEDICAL ADVICE.

NEVER GIVE ANYTHING ORALLY IF THE VICTIM IS UNCONSCIOUS AND DO NOT GIVE ANY KIND OF ANTIDOTES UNLESS EXPRESSLY PRESCRIBED.

## 5. FIRE HAZARD DATA

Extinguishing media: USE WATER. SPRINKLE WITH WATER. CONTAINERS THAT ARE EXPOSED TO FIRE. IF CLOTHES ARE BURNING, USE PLENTY OF WATER RATHER THAN COVERS TO EXTINGUISH THEM.  
 Extinguishing media to avoid: CO<sub>2</sub>  
 Unusual fire hazard: O<sub>2</sub>, ACID FUMES AND Na<sub>2</sub>O FUMES  
 Personal equipment: SELF-CONTAINED BREATHING APPARATUS

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## 6. ACCIDENTAL SPILL RESPONSE

REMOVE INCOMPATIBLE SUBSTANCES. CIRCUMSCRIBE THE CONCEPINED AREA AND PREVENT THE PRODUCT FROM ENDING UP IN DRAINS AND/OR WATER. COLLECT THE PRODUCT IN EMERGENCY CONTAINERS. THEN WASH THE RESIDUES WITH PLENTY OF WATER, NEUTRALISING WITH REDUCING AGENTS (SODIUM SULPHITE/DISULPHITE).

## 7. HANDLING AND STORAGE

Protective measures for handling:

AVOID CONTACT WITH EYES, SKIN, MEMBRANES AND CLOTHING.

USE NEOPRENE GLOVES AND BOOTS, GOGGLES AND FIRE-PROOF OVERALLS.

KEEP A MASK WITH TOXIC GAS FILTER AT HAND FOR ANY OCCURRENCE OF  $\text{ClO}_2$  EVOLUTIONS.

KEEP ROOMS VENTILATED; INSTALL EXHAUST VENTILATION EQUIPMENT IN WORKING PLACES.

Protective measures for storage:

KEEP AWAY FROM ACIDS, COMBUSTIBLE SUBSTANCES AND HEAT SOURCES, IN A FRESH AND WELL-VENTILATED ENVIRONMENT.

MATERIALS TO AVOID: STEEL, COPPER OR ITS ALLOYS.

APPROPRIATE MATERIALS: GLASS, PVC, POLYETHYLENE, POLYESTER AND SOME STAINLESS STEEL.

## 8. INDUSTRIAL HYGIENE/PERSONAL PROTECTIVE EQUIPMENT

Sanitary inspection:

IN COMPLIANCE WITH APPLICABLE NATIONAL AND LOCAL REGULATIONS.

Exposure limits:

TLV-TWA (ACGIH 1999) = 0.1 ppm (AS CHLORINE DIOXIDE)

TLV-STEL (ACGIH 1999) = 0.3 ppm (AS CHLORINE DIOXIDE)

Respiratory protection:

DURING PRODUCT USE AND HANDLING ABSOLUTELY AVOID THE FORMATION OF VAPOURS AND/OR AEROSOL. IN CASE OF ACCIDENTAL FORMATION, AVOID INHALING THEM AND IMMEDIATELY PUT ON AN ANTIGAS MASK WITH TOXIC GAS FILTER.

Hand protection:

NEOPRENE GLOVES.

Eye protection:

SAFETY GOGGLES.

Skin protection:

APPROPRIATE PROTECTIVE CLOTHING (FIRE-PROOF OVERALLS AND NEOPRENE BOOTS).

System technical protection:

SUITABLE ROOM VENTILATION, LOCAL AIR SUCTION.

## 9. PHYSICAL AND CHEMICAL DATA

Physical state:

AQUEOUS SOLUTION

Colour:

STRAW YELLOW

Odour:

ODOURLESS

pH:

12 APPROX

Flash point:

NOT FLAMMABLE

Freezing point:

0°C APPROX

Boiling point:

DECOMPOSITION AT  $T > 140^\circ\text{C}$  (DECOMPOSITION PRODUCTS: CHLORATE, CHLORIDE, IT MAY DEVELOP OXYGEN)

Self-ignition:

Explosion hazard:

Combustion hazard:

DRIED SOLUTION IS A STRONG OXIDIZING AGENT.

Vapour pressure:

Density:

1.20-1.30  $\text{g/cm}^3$  at  $15^\circ\text{C}$

Solubility in water:

TOTAL

Liposolubility:

Solubility in solvents:

INSOLUBLE

n-octanol/water partition coefficient:

Vapour specific gravity related to air:

LEL - UEL (% in volume):

Conductivity:

Viscosity:

Evaporation rate:

Other features:

## 10. STABILITY AND REACTIVITY

Conditions to avoid:

PREVENT THE PRODUCT FROM HEATING, TO AVOID ITS CONCENTRATION.



# MATERIAL SAFETY DATA SHEET



**BIOCAF 1320**

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SNIA

Materials to avoid:

THE SOLUTION DOES NOT POSE ANY RISK OF FIRE OR EXPLOSION.  
ANY SPILL MUST BE REMOVED BEFORE THE SOLUTION DRIES; DRIED SOLUTION  
IS A STRONG OXIDIZING AGENT AND IT CAN GENERATE FLAMMABLE AND  
EXPLOSIVE MIXTURE WITH COMBUSTIBLE SUBSTANCES AND EASILY OXIDABLE  
MATERIALS.  
CONTACT WITH ACIDS LIBERATES CHLORINE DIOXIDE, TOXIC AND EXPLOSIVE  
GAS.

Hazardous decomposition products: O<sub>2</sub>, ACID FUMES IN CASE OF FIRE.

## 11. TOXICOLOGICAL INFORMATION

Penetration ways:

☒ Ingestion

☒ Inhalation

☒ Contact

Acute toxicity:

LD<sub>50</sub> (RAT ORAL TEST) - 532 mg/kg (ONLY REFERRED TO SODIUM CHLORITE IN  
31% SOLUTION)

Chronic toxicity:

Corrosiveness/irritating power

- skin:

- eyes:

- respiratory system:

MAY BE IRRITANT TO SKIN.

HIGHLY IRRITANT.

IN CASE OF ACCIDENTAL FORMATION OF VAPOURS AND AEROSOL, THE  
FOLLOWING CAN TAKE PLACE:

- RISKS OF SERIOUS IRRITATION TO THE BREATHING SYSTEM.

- RISKS OF METHEMOGLOBINEMIA.

THE A.M. RISKS WERE HIGHLIGHTED IN TESTS PERFORMED ON ANIMALS.

Sensitising power:

Carcinogenicity:

Mutagenicity:

Teratogenesis:

Narcotising effects:

## 12. ECOLOGICAL INFORMATION

Possible effects, behaviour and transformation in the environment:

USE IN COMPLIANCE WITH GOOD LABORATORY PRACTICES (GLPs) AND DO NOT SCATTER THE PRODUCT IN  
WATER OR SOIL.

Mobility:

Persistence and bio-degradability:

Bio-accumulation potential:

Water toxicity/ecotoxicity:

Remarks:

## 13. RECOMMENDED DISPOSAL

Waste safety handling:

RE-USE IF POSSIBLE, HANDLE IN ACCORDANCE WITH APPLICABLE LOCAL AND  
NATIONAL REGULATIONS.

Disposal methods:

- Waste:

- Product containers:

Remarks:

AUTHORIZED CHEMICAL-PHYSICAL TREATMENT PLANTS

PURIFY BY WATER RINSING.

Note: Be sure to observe any other applicable national or local regulations.

## 14. TRANSPORT INFORMATION

Protective measures for transport/handling:

Classification:

Item: "CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S., CONTAINS MIXTURE OF ALKALINE CHLORITES" UN No.: 3266

- road and railway transport:

RID/ADR: Class 8 Ord. 47 ° b) Label No. 8 Danger ID No. 80/3266

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- carriage by sea:

IMDG code: Class 8

Pg. 8147-1 (Admt 29-98)

Label No.: 8

EmS: 8-15

MFAG: 766

- air transportation:

ICAO/IATA: Class 8

Label No.: 8

- packing class: II

## 15. REGULATION INFORMATION

Classification and labelling

☐ Required by law

☒ Interim

☐ Not required

Hazard symbol:

Xi

Hazard sign:

IRRITANT

Risk phrases:

R 32:

CONTACT WITH ACIDS LIBERATES VERY TOXIC GAS.

R 41:

RISK OF SERIOUS DAMAGE TO EYES.

Safety advices:

S 17:

KEEP AWAY FROM COMBUSTIBLE MATERIAL.

S 26:

IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

S 36/37/39:

WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.

European Community provisions with regard to man and environment protection:

Note: Always be sure to meet any other applicable local regulation.

## 16. OTHER INFORMATION

Training

Recommendations for use / possible restrictions

Further information

Usage of substance/product

AS GENERATOR OF CHLORINE DIOXIDE IN DRINKING WATER DISINFECTION OR INDUSTRIAL EFFLUENTS PURIFICATION AND IN DEODORIZATION PROCESSES.

The information on this DATA SHEET represents our current data and best opinion as to the proper use in handling this product under normal conditions. Using the product in combination with any other product or process is the responsibility of the user. The user shall always be sure to meet any local regulations pertaining to the product, industrial hygiene and working security.

ISSUE

ISSUING/CERTIFYING BODY

Safety and Environment Protection Service

LICENSING BODY

Production Unit

Department

*Stiverin*

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# **Attachment 8**

## ***EMS Procedures***

# **METHODOLOGY FOR THE MANUAL MEASUREMENT OF EMISSIONS FROM COMBUSTION PLANTS AT MARSA & DELIMARA**

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**EU Affairs Section  
October 2006**

Issue: Original	October 2006	
Revision	1	
	2	

## 1.0 Objective

- 1.1 The objective of this methodology is to establish the *manual* methods that are to be used in the measurement of flue emissions from combustion plants at Marsa and Delimara using the available portable equipment. Online automated continuous measuring systems for flue emissions are not covered by this methodology.

## 2.0 Scope

- 2.1 The scope of this methodology includes only those measurements in respect of the following stack emissions and as required by *EU Directive 2001-80-E, i.e.:*
- i. Dust Emissions (or Particulate Matter, PM)
  - ii. Gas Emissions:
    - a. SO<sub>2</sub>
    - b. NO<sub>x</sub> (measured as NO<sub>2</sub>).

## 3.0 Standards EU Directives & other References

- 3.1 The methodology followed in this document follows the requirements or recommendations indicated in the following standards or EU Directives:
- i. **2001/80/EC: EU Directive** on the limitation of emissions of certain pollutants into the air of Large Combustion Plants, commonly known as the *LCPD*.
  - ii. **ISO 9096: 2003:** Stationary source emissions – Manual determination of mass concentration of particulate matter.
  - iii. **ISO 10780: 1994:** Stationary source emissions – Measurement of velocity and volume flowrate of gas streams in ducts.
- 3.2 Other references used in this methodology are indicated by the corresponding footnote to the text.

## 4.0 Background

- 4.1 Power plants contribute to pollution in the atmosphere primarily through emissions of solid fly ash or suspended particulates, and sulphur oxides and nitrogen oxides, which react in the atmosphere to form aerosol particles. SO<sub>x</sub> emissions can transform into sulphates, whereas NO<sub>x</sub> can transform into nitrates.
- 4.2 **Dust particulates** are normally measured in milligrams per cubic metre of discharged flue gas (mg/m<sup>3</sup>) and their size attributes are usually measured in aerodynamic diameter. Particulate matter exceeding 10 microns (µm) is generally defined as **coarse particles** while particles smaller than 10 microns are called ***fine particles***. Fine particulates **PM<sub>10</sub>** and **PM<sub>2.5</sub>** (particles smaller in size than 10 µm and 2.5 µm respectively) are the most likely to cause adverse health effects and they have to be measured using size-selective filters<sup>1,2</sup>. Typical filter materials include borosilicate glass fibre, quartz/silica fibre, or PTFE-silica fibre.

<sup>1</sup> EU Technical Working Group on Particles, Ambient Air Pollution by Particulate Matter Position Paper, 1997, pp.8, 18-19.

<sup>2</sup> The World Bank Group, Pollution Prevention and Abatement Handbook 1998 *Towards Cleaner Production*, 1998, pp201-202

- 4.3 **Sulphur dioxide**,  $\text{SO}_2$ , is the predominant form of generated sulphur oxides ( $\text{SO}_x$ ) and their emissions are proportional to the sulphur percentage in the fuel. Hence low sulphur ( $< 1\%$ ) content fuel is preferred as a direct means of reducing  $\text{SO}_x$ <sup>3</sup>. Sulphur dioxide is measured either in parts per million (ppm) or in milligrams per cubic metre of discharged flue gas,  $\text{mg}/\text{m}^3$ .
- 4.4 **Nitrogen Oxides**,  $\text{NO}_x$ , are generated in the combustion process by either oxidation of nitrogen within the fuel, or oxidation of free nitrogen present in the combustion air. The main forms are oxides found in the flue gas are:
- i. NO Nitric Oxide
  - ii.  $\text{NO}_2$  Nitrogen Dioxide
  - iii.  $\text{N}_2\text{O}$  Nitrous Oxide.
- 4.5 The most important are NO and  $\text{NO}_2$  and usually in flue gas analysis NO represents 96 ÷ 97% of the total, the balance being  $\text{NO}_2$  (3 ÷ 4%). However the ratio of NO/ $\text{NO}_2$  in the boiler is completely reversed in the atmosphere due to the low temperatures and high oxygen concentrations, effectively shifting to a predominance of  $\text{NO}_2$ . Hence what is really important is not the quantity of NO in the stack but the amount converted into  $\text{NO}_2$  as a pollutant in the atmosphere. **The new meaning of  $\text{NO}_x$  will therefore be equal to the Total of [measured  $\text{NO}_2 + \text{NO}_x$  (NO computed as  $\text{NO}_2$ )]<sup>4</sup>.** Therefore European national standards agree in defining the emissions of  $\text{NO}_x$  measured in terms of  $\text{NO}_2$  and it is also the basis of the EU Directive 2001/80/EC. Nitrogen oxides,  $\text{NO}_x$ , are also measured either in parts per million (ppm) or in milligrams per cubic metre of discharged flue gas,  $\text{mg}/\text{m}^3$ .

## 5.0 Measuring Equipment

- 5.1 The available portable equipment used for carrying out the tests is the following:
- 5.1.1 **Particulates:** for measuring dust the following equipment supplied by *Zambelli Air Quality Systems* and *Advantec Mfs. Inc.* are used. The analysers comply with *ISO standard 9096*<sup>5</sup>.
- i. Zambelli isokinetic particulate analysers, model 6000 ISOPLUS, V8E
  - ii. Zambelli flue gas refrigerators, model WM 15
  - iii. Zambelli probes with an “S” Pitot tube complete with thermocouple and sampling tube as per *ISO Standard 10780:1994*.
  - iv. Advantec extraction filter thimbles, type 86R (borosilicate glass fibre) and in compliance with *ISO Standard 9096: 2003*, section 6.2.5.
- 5.1.2 **Gases:** equipment supplied by *Eurotron Instruments SpA* is used for measuring gases. These analysers have technical specifications and performance in line with “Protocols” that have been established by various countries or state regulatory agency to verify industrial emissions using portable analysers to ensure air quality compliance. These protocols are the guidelines which prescribe the technical performance of the electrochemical based sensors used, as well as

<sup>3</sup> The World Bank Group, Pollution Prevention and Abatement Handbook 1998 *Towards Cleaner Production*, 1998, p258

<sup>4</sup> Eurotron Italiana S.R.L., Nitrogen Oxides Analysis in Thermal Processes

<sup>5</sup> Zambelli Air Quality Systems, Instruction Manual for 6X00 PLUS.V8E analyser, p.1

calibration and testing procedures which should be followed to assure valid emission data<sup>6</sup>. In particular, they are fully compliant to the US *Environmental Protection Agency (EPA) Protocols CTM-030*<sup>7</sup> and *CTM-034*<sup>8</sup>. In addition the equipment is also in conformance with *MSA EN 50379-1/2/3*<sup>9</sup> requirements (refer to **APPENDIX VIII**). The following equipment is available:

- i. Portable flue gas analyser, model GreenLine 8000 (MCU and RCU units) complete with electrochemical sensors for O<sub>2</sub>, CO, NO, NO<sub>2</sub>, SO<sub>2</sub>; NDIR sensors for CO and CO<sub>2</sub>; and NO<sub>x</sub> (calculated).
  - ii. Industrial gas probe, Ø 8mm by 1500mm length
  - iii. Heated 3m long hose.
- 5.1.3 The above equipment should be maintained in working order and re-calibrated as indicated by the equipment supplier.
- 5.1.4 Certificates and/or Declarations of Conformity and Quality Assurance of the equipment are listed in **APPENDIX VIII**, together with their respective copies.

## 6.0 Methods of measurement

### 6.1 Measurement of Particulates:

- 6.1.1 The manual method used to measure the concentration of dust or particulates is based on *ISO 9096: 2003*. Basically this is a sampling method based on taking various samples in a predetermined time interval and is dependent on various conditions<sup>10</sup> but the main criteria may be considered the following:
- i. Homogeneity of the gas velocity within the sampling plane
  - ii. Sufficient sampling points in the sampling plane
  - iii. Isokinetic withdrawal of the sample
- Gas velocity, temperature and pressure are measured by means of a combination of an S Pitot tube arrangement to *ISO 10780*<sup>11</sup> standard and a temperature probe. Sampling is taken by an “in-stack” filter arrangement.
- 6.1.2 Sampled particulate matter is captured in an appropriate filter as specified in *ISO 9096: 2003*<sup>12</sup> whose *dry mass* is measured before and after the test. Therefore drying of the filter thimble is important. It is also necessary to avoid condensation of water vapour since this

<sup>6</sup> Eurotron Instruments SpA, GreenLine 8000 Portable flue gas analysers Instruction Manual MM850371, ed. 4c, p. 6

<sup>7</sup> Gas Research Institute Method GRI-96/0008. EMC Conditional Test Method (CTM-030). Determination of Nitrogen Oxides, Carbon Monoxide, and Oxygen Emissions from Natural Gas-Fired Engines, Boilers and Process Heaters Using Portable Analyzers.

<sup>8</sup> ICAC Test Method For Periodic Monitoring. Test Method – Determination of Oxygen, Carbon Monoxide and Oxides of Nitrogen from Stationary Sources For Periodic Monitoring (Portable Electrochemical Analyzer Procedure)

<sup>9</sup> MSA EN 50379. Specification for portable electrical apparatus designed to measure combustion flue gas parameters of heating appliances – Part 1(2004): General requirements and test methods. Part 2 (2004): Performance requirements for apparatus used in statutory inspections and assessment. Part 3 (2004): Performance requirements for apparatus used in non-statutory servicing of gas-fired heating appliances.

<sup>10</sup> Refer to ISO 9096: 2003, Section 4.1, p5

<sup>11</sup> Refer to ISO 10780: 1994, Section 5.1.2, pp3-5

<sup>12</sup> Refer to ISO 9096: 2003, Section 6.2.5, p11

dissolves part of the SO<sub>2</sub> and NO<sub>x</sub> gases in the stream interfere with dust separation and condition, hence leading to false measurements. For this scope the *probe assembly is heated above the relevant dew point* and then the vapour is immediately removed prior passing through the dry analyser meter/s by means of the refrigerator unit. The amount of water vapour present depends on both combustion AND atmospheric conditions prevailing at the time of the test and a correct estimation of the water concentration in the stack is important since the particulates reading is sensitive to vapour content. Hence it has to be monitored. Preferably a ***preliminary test*** is recommended to establish the preset conditions of the measurement process, although historic data will help considerably. Prior to the testing the analyser has to be calibrated to set the Zero setting of the sensors, and to be preset with particular data relevant to the test conditions as indicated in the instrument menu set-up procedures.

## 6.2 Measurement of Gases:

6.2.1 Gas analysis equipment used for measuring concentrations of contaminant gases uses electrochemical (EC) sensors for O<sub>2</sub>, CO, NO, NO<sub>2</sub>, and SO<sub>2</sub>. However, for the CO<sub>2</sub> a *non-dispersive infrared sensor* (NDIR) is used (i.e., based on infrared spectroscopy principles). The gas sampling probe is also heated to avoid condensation of water vapour and hence of NO<sub>x</sub> and SO<sub>2</sub> into the water, leading to false readings. Hence the analyser will have to dry the gas as soon as possible prior measurements by means of a Peltier cooler and purges the condensate out of the system. Finally the gas analyser also filters dust particles and purges the system with fresh air after use in order to establish fresh air as reference (20.9% for O<sub>2</sub> cell).

6.3 In all cases, the choice of sampling points is determined by the related EN or ISO standards and available sampling nozzles on site. Remote site sampling points may be used provided that the appropriate equipment sampling facilities exist or is available (e.g., permanently installed probe for automated sampling, effective sampling line heating).

6.4 Inaccuracies of the methods used are those indicated either in the relevant standard or those specified by the equipment manufacturer concerned.

## 7.0 Basis of Measurement and Normalisation

7.1 Concentrations of dust are measured in mg/m<sup>3</sup>, whilst SO<sub>2</sub>, and NO<sub>x</sub> are measured in ppm or mg/m<sup>3</sup>. In the case of gases the ppm value can be converted to weight measure as mg/m<sup>3</sup> by multiplying it with the specific weight of the particular gas. Assuming the specific weight as a ratio between the molecular weight (MW) in grams and the molecular volume in litres<sup>13</sup> (MV = 22.41, derived from the Ideal Gas law: PV = nRT),

i.	MW (SO <sub>2</sub> )	=	32 + 32	=	64
ii.	MW (NO)	=	14 + 16	=	30
iii.	MW (NO <sub>2</sub> )	=	14 + 32	=	46
iv.	MV (SO <sub>2</sub> , NO, NO <sub>2</sub> )	=	22.41.		

<sup>13</sup> 22.4 litres is the volume of one mole of ideal gas at standard temperature and pressure, irrespective of the constituents of the gas.



## 7.2 Therefore:

- i.  $\text{SO}_2 \text{ mg/m}^3$   
2.86 =  $\text{SO}_2 \text{ ppm} \times (64 \div 22.41)$  =  $\text{SO}_2 \text{ ppm} \times$
- ii.  $\text{NO mg/m}^3$   
1.34 =  $\text{NO ppm} \times (30 \div 22.41)$  =  $\text{NO ppm} \times$
- iii.  $\text{NO}_2 \text{ mg/m}^3$   
2.05 =  $\text{NO}_2 \text{ ppm} \times (46 \div 22.41)$  =  $\text{NO}_2 \text{ ppm} \times$

7.3 However actual stack waste gas emission temperatures vary and hence their corresponding volumes. Therefore in order to provide means of data comparison and setting standards for allowable emissions of dust and gases, when determining the mass flow of polluting emissions one has to qualify this measurement to a set value of the volumetric flow rate of total stack gasses. This is done by “**normalising**” the total flow rate to a *Standard Temperature and Pressure* of 0° Celsius (273 K) and 101.3 kPa respectively<sup>14</sup>. Therefore when the values are normalised the units are expressed in “*normalised cubic metres*”, i.e.,  $\text{mg/Nm}^3$ . Moreover the percentage of oxygen in the waste stream has to be qualified also and European Directives have established various percentages, depending mainly on the type of fuel used and the type of plant. In the case of Enemalta steam boilers burning liquid fuels the percentage oxygen ( $\text{O}_2\%$ ) is 3%<sup>15</sup>, whilst in the case of liquid fuels for gas turbine plants this is 15%<sup>16</sup>. Hence the **measured value** as sensed by the instrument and the **computed value** as referenced to the established percentage of oxygen. The standards also establish the following formulae to compute a measured value to the preset % oxygen:

- i.  $\text{SO}_2 \text{ normalised } [\text{mg}/\text{Nm}^3] = \text{SO}_2 [\text{measured in ppm}] \times \left[ \frac{(20.9 - \% \text{O}_2 \text{ normalised})}{(20.9 - \% \text{O}_2 \text{ measured})} \times \frac{64}{22.4} \right]$
- ii.  $\text{SO}_2 \text{ normalised } [\text{mg}/\text{Nm}^3] = \text{SO}_2 [\text{measured in mg}/\text{m}^3] \times \left[ \frac{(20.9 - \% \text{O}_2 \text{ normalised})}{(20.9 - \% \text{O}_2 \text{ measured})} \right]$
- iii.  $\text{NO}_2 \text{ normalised } [\text{mg}/\text{Nm}^3] = \text{NO}_2 [\text{measured in ppm}] \times \left[ \frac{(20.9 - \% \text{O}_2 \text{ normalised})}{(20.9 - \% \text{O}_2 \text{ measured})} \times \frac{46}{22.4} \right]$
- iv.  $\text{NO}_2 \text{ normalised } [\text{mg}/\text{Nm}^3] = \text{NO}_2 [\text{measured in mg}/\text{m}^3] \times \left[ \frac{(20.9 - \% \text{O}_2 \text{ normalised})}{(20.9 - \% \text{O}_2 \text{ measured})} \right]$
- v.  $\text{NO normalised } [\text{mg}/\text{Nm}^3] = \text{NO} [\text{measured in ppm}] \times \left[ \frac{(20.9 - \% \text{O}_2 \text{ normalised})}{(20.9 - \% \text{O}_2 \text{ measured})} \times \frac{30}{22.4} \right]$
- vi.  $\text{NO normalised } [\text{mg}/\text{Nm}^3] = \text{NO} [\text{measured in mg}/\text{m}^3] \times \left[ \frac{(20.9 - \% \text{O}_2 \text{ normalised})}{(20.9 - \% \text{O}_2 \text{ measured})} \right]$

## 7.4 Moreover:

- i.  $\text{NO}_{X(\text{NO}_2)} \text{ OR } \text{NO}_{2\text{Total}} \text{ normalised} = \text{NO}_2 [\text{mg}/\text{Nm}^3] + \left[ \text{NO} [\text{mg}/\text{Nm}^3] \times \frac{\text{ppm NO}_2}{\text{ppm NO}} \right]$   
 $\therefore \text{NO}_{X(\text{NO}_2)} \text{ OR } \text{NO}_{2\text{Total}} \text{ normalised} = \text{NO}_2 [\text{mg}/\text{Nm}^3] + \left[ \text{NO} [\text{mg}/\text{Nm}^3] \times \frac{46}{30} \right]$   
*i.e.,*  $\text{NO}_{X(\text{NO}_2)} \text{ OR } \text{NO}_{2\text{Total}} \text{ normalised} = \text{NO}_2 [\text{mg}/\text{Nm}^3] + [\text{NO} [\text{mg}/\text{Nm}^3] \times 1.533]$

<sup>14</sup> EU Directive 2001/80/EC, Article 2 (2).

<sup>15</sup> EU Directive 2001/80/EC, ANNEX IV, ANNEX VI, & ANNEX VII.

<sup>16</sup> EU Directive 2001/80/EC, ANNEX VI (B).

7.5 Flue gas analysers also measure *Carbon Monoxide (CO)* and *Carbon Dioxide (CO<sub>2</sub>)*, which are also present in the flue gas stream, although these gases are not included in the *EU Directive 2001/80/EC*, their measurement follows similar normalisation procedures in the gas analysers:

- i.  $CO_{normalised} [mg/Nm^3] = CO [measured \text{ in ppm}] \times \left[ \frac{(20.9 - \%O_2_{normalised})}{(20.9 - \%O_2_{measured})} \times \frac{28}{22.4} \right]$
- ii.  $CO_{normalised} [mg/Nm^3] = CO [measured \text{ in } mg/m^3] \times \left[ \frac{(20.9 - \%O_2_{normalised})}{(20.9 - \%O_2_{measured})} \right]$
- iii.  $CO_2_{normalised} [mg/Nm^3] = CO_2 [\%] \times \left[ \frac{(20.9 - \%O_2_{normalised})}{(20.9 - \%O_2_{measured})} \right]$

7.6 In the case of dust (particulates) analysers using *isokinetic sampling* techniques the following formulae are applicable:

- i. **Particulates Mass Flow Rate,  $P_F$**   

$$P_F [g/s] = \frac{\text{sampled dust mass} \times \text{stack area}}{\text{Test Duration} \times \text{sampling nozzle area}}$$

$$= \frac{(M_{FA} - M_{FB})[g] \times \text{Stack Area}[mm^2] \times 4}{\text{Test Duration}[\text{min}] \times 60 \times \pi D_N^2[mm^2]}$$
- ii.  $Particulates [mg / Nm^3] = \left[ \frac{P_F \times 60 \times 60}{\text{Dry Flow Rate}[Nm^3 / h]} \right] \times \left[ \frac{20.9 - \%O_2_{normalised}}{20.9 - \%O_2_{measured}} \right]$
- iii.  $Particulates [mg / Nm^3] = \left[ \frac{(M_{FA} - M_{FB})[g] \times 1000}{\text{Volume of Air Sampled}[Nm^3]} \right] \times \left[ \frac{20.9 - \%O_2_{normalised}}{20.9 - \%O_2_{measured}} \right]$
- iv.  $Flue \text{ Gas Water Concentration} [g / Nm^3] = \left[ \frac{\text{Volume of Water Collected}[ml] \times 1000}{\text{Intake Volume of Analyser Meter}[NI]} \right]$

Where:

$M_{FB}$  = Dry Mass of sampling filter BEFORE test

$M_{FA}$  = Dry Mass of sampling filter AFTER test.

## 8.0 Procedures of Measurements

8.1 Detailed procedures of how the particulates and gas analysis tests are carried out are presented in **APPENDIX I** and **APPENDIX II** respectively. **APPENDIX III** (developed by DPS laboratory staff) represents the data form that may be used to noting of data for test.

8.2 Test duration for dust tends to be lengthy (2 to 3 hours) since the whole procedure is rather laborious, even if no preliminary tests are carried out. Hence this is a limiting factor on the frequency of testing for particulates, especially when more than one plant is running.

8.3 Test duration for gases requires less time than that for particulates and, if testing conditions permit, sampling from remote points at ground level can speed up the whole procedure since permanently installed sampling probes are used for sample collection.

## 9.0 Authorised Personnel & Responsibilities

- 9.1 Only competent personnel authorised by their station managers are responsible for using the analysers and taking measurements. Such competence is achieved by following appropriate training programme/s organised in-house and/or externally as and whenever necessary. For this scope individual records on any participation in training programmes are to be kept by the station manager and the Human Resources section of the Corporation. Station managers have to ensure that any supporting services are provided to these personnel in order to take measurements.
- 9.2 Therefore it is the responsibility of these personnel to carry out the following tasks and report to their direct superior and/or station manager about:
- i. Plant Emissions performance
  - ii. Emissions measuring equipment malfunctions for immediate repair as necessary
  - iii. Orders for consumables and equipment replacement parts
  - iv. Emissions measuring equipment re-calibration requirements as necessary
  - v. Potential site, sampling equipment, environmental, chemical, physical, and other health hazards, hence recommending appropriate control measures.
- 9.3 On the other hand the station manager, after reviewing the emissions report, is responsible to submit the report to the Chief Technical Officer for further processing as necessary and reporting to other staff and sections as appropriate, including the EU Affairs Office. It is the responsibility of the EU Affairs Office to pass emissions data to MEPA, the regulatory Authority, when and as required.

## **10.0 Authenticity of Reported Data & Report Format**

- 10.1 Emissions measurements involve the following sub-tasks:
- i. Plan for emissions measurements
  - ii. Carry out site measurements
  - iii. Collate data with plant operating conditions and fuel parameters
  - iv. Record data
  - v. Analyse and check data for consistency with expected performance
  - vi. Report data.
- 10.2 It is very important that only realistic and verifiable data is reported to the station manager. If measured data is suspected to be false or incorrect records are only kept by the personnel carrying out the test/s who will then evaluate the possible reasons for the wrong readings and record such reasons. The personnel concerned is also obliged to inform by e-mail or formal report the station manager about any emissions measuring problems and keep record and report those periods of plant operation when emission readings could not be taken.
- 10.3 The emissions report submitted to the station manager should include the following details:
- i. Basic plant operating conditions
  - ii. Fuel Data
  - iii. Basic stack description
  - iv. Actual stack conditions
  - v. Details about measured values during test
  - vi. Normalised values, indicating error percentages and associated ranges as reported by the instrument
  - vii. Any other remarks relevant to the report.

- 10.4 Appropriate separate report formats for particulate matter and gases are given in **APPENDIX IV** and **V** respectively (developed by DPS laboratory staff).
- 10.5 Acceptable emission limit values (ELVs) as per *Directive 2001/80/EC (LCPD)* vis-à-vis existing plants at Marsa and Delimara Power Stations are presented in **APPENDIX VI**. This is based on the current operation practice of the individual plants. Basically, given the existing circumstances and Directive requirements, ELVs are those that have to be achieved by 1<sup>st</sup> January 2008 as dictated by the same Directive.

## 11.0 Frequency of Measuring & Data Reporting on Emissions

- 11.1 Manual measurement of emissions should be carried out at a regular interval as follows:

Conditions	Particulates	Gases
Plant steady state operation	Fortnightly	Weekly
After plant overhaul/repair works	Soon after plant is put on line and stabilised	Soon after plant is put on line and stabilised
After emission equipment repair works or recalibration	Soon after equipment is operational	Soon after equipment is operational
<b>Remarks:</b> <ul style="list-style-type: none"> <li>• At least one complete set of emissions data per plant per month</li> <li>• Steady state plant conditions assume no soot blowing operations or changes in load</li> <li>• The above frequencies take into account the number of plants that may be running simultaneously, the duration of the tests, environmental conditions, and the other duties of the personnel involved in the tests.</li> </ul>		

## 12.0 Methodology & Procedures Reviews

- 12.1 The methodology and procedures presented in this document shall be subject to a *regular annual review*. However any changes required by any personnel shall be reviewed when necessary and implemented following approvals.
- 12.2 For traceability purposes amendments in the procedure are to be recorded and documented as per **Review Record Form**, shown in **APPENDIX VII**.
- 12.3 Reviews in the procedure shall be carried out by those personnel appointed by the Chief Technical Officer or his appointee, who will then approve or otherwise any requested amendments.

## APPENDIX I: PROCEDURE FOR FLUE PARTICULATE SAMPLING

### USING ISOKINETIC SAMPLING APPROACH

PROCEDURE		REMARKS
<b>Equipment required at sampling site on duct</b>		
1	Zambelli 6000 ISOPLUS Particulate Analyser	
2	Zambelli flue gas Refrigerator, Model WM 15	
3	Zambelli isokinetic probe + nozzle probe head c/w filter ( <i>head left loose to be fitted on site to avoid handling damage</i> )	
4	Online printer c/w power and data cables	
5	Associated electrical cables, leads	
6	Associated flexible tubing (as indicated below)	
7	Vacuum pressure gauge	
8	Measuring cylinder	
9	Electrical data sensor cable for probe to analyser	
10	Cooling water (2x5litre cans)	
11	2 off 13mm open jaw spanners	
12	2 off 24mm open jaw spanners	
13	1 straight blade screwdriver	
14	Adaptor flange for probe to fit sampling nozzle housing	
15	PPE equipment as necessary at site	
<b>Preliminary Planning for Test</b>		
	Inform Generation Officer about sampling requirement indicating which Boiler in order to maintain steady loading conditions and not carrying out any soot blowing	
	Advise STO (Mechanical Plant) to send employees to transport equipment to sampling site	
<b>Tasks to be carried out at office &amp; laboratory</b>		
	<b>Probe thimble filter preparation:</b> Dry new thimble filter in oven for approx. 2 hours at 100degC in a sealed beaker	Take note duration of drying
	Put thimble filter in desiccator for cooling and then weigh thimble in a precision analytical scale.	grams
	Place filter in thimble holder and mount in gas S-shaped sampling nozzle probe head, ensuring air-tightness by tightening using appropriate spanners, and minimal handling without touching	Use of 6mm S-shaped nozzle
	Take current atmospheric pressure from Weather website	Convert from hPa to mmHg
	Fill in Data Form	Refer to <b>Appendix III</b>
	Prepare items to be carried to site. Items are carried by MPS/DPS employees to sampling site	
<b>On Site: Equipment Preparation prior sampling</b>		
	Place analyser & cooler next to or just above sampling point, ensuring safety of access and protection of equipment	

PROCEDURE		REMARKS
	Fill cooler with water sufficient enough to cover cooling coil	
	Prepare electric extension cable from nearest power point	
	Connect electrically analyser, cooler and printer (including data cable to analyser)	
	Connect Cooler cooling water circulation tubing	
	Start Cooler to cool down water close to 0 deg C by checking circulation in tubing	
	<b>Connect gas flexible tubing as follows:</b>	
	1 From cooler to analyser c/w <b><i>vacuum pressure gauge</i></b>	
	2 From analyser outlet to atmosphere	
	3 <b><i>Gas velocity measurement:</i></b> from <b><i>positive</i></b> pressure connection at Analyser to <b><i>positive</i></b> pressure pitot tubing connection on probe	
	4 <b><i>Gas velocity measurement:</i></b> from <b><i>negative</i></b> pressure connection at Analyser to <b><i>negative</i></b> pressure pitot tubing connection on probe	
	5 From S-shaped sampling nozzle probe connection to Cooler inlet	
	<b>Connect gas data (temp., etc.) electric sensor as follows:</b>	
	1 From analyser inlet to probe connection	
	Set jubilee clip positions on probe for the 3 distance positions of the probe	
	Loosen blank flange from sampling nozzle and instead bolt up probe adaptor flange	
<b>On Site: Setting up Analyser</b>		
	Switch on analyser and printer	
	Start set-up of analyser procedure by entering data references about:	
	1 Date and time of sampling	Various
	2 Barometric pressure	mmHg
	3 Type and size of duct	Rectangular / Round
	4 Size of nozzle	6mm
	5 K factor of differential pressure measurement tube (probe constant)	0.73
	6 Probe distances	Various
	7 Filter identification number	Enter as 1(nominal)
	8 Filter weight	Enter as 1(nominal)
	9 Sampling time	45 minutes
	10 Estimated water vapour content in flue gas, based on historical data & humidity conditions on site. <b><i>Preferably a preliminary test is carried out to determine actual conditions for data input into analyser.</i></b>	g/Nm <sup>3</sup> (varies between 70 ~ 125)
	11 Normalisation temperature	0 deg C
	12 Density of dry flue gas at STP	1.29
	13 Nitrogen %	83
	14 Oxygen %	3
	15 Carbon Dioxide %	14
<b>On Site: Leakage testing of probe (outside)</b>		
	Run leakage test of probe when indicated by Analyser by blanking nozzle inlet by thumb and watching vacuum gauge reading down to over 600mmHg. If OK test can be started after inserting probe in sampling nozzle	Vacuum reading should exceed 600 mmHg
<b>On Site: Carrying out test</b>		
	Insert probe by ensuring:	
	# Nozzle direction is in the direction of the coming flue gases	
	# Place probe for first position	

PROCEDURE		REMARKS
	Note mechanical flow counter gas flow reading on analyser prior sampling	litres
	Start sampling procedure on Analyser and check performance for normal operation	
	Insert probe further to second position and check for small vacuum reading on vacuum gauge	After 15 minutes
	Insert probe further to third position, after which the analyser will stop automatically	After 15 minutes
	Collect flue gas condensed water in tubing next to probe into measuring cylinder	Note quantity in ml
	Empty flue gas condensed water at cooler end into the measuring cylinder using built in pump and on top of that collected from probe end. Change water concentration when prompted by analyser and enter measuring cylinder value	Note total ml reading
	Conclude test routine on analyser and take test printout, checking for consistency of results in respect of:	
#	Water vapour condensed quantity	
#	Expected particulates measurement	
#	Temperature conditions	
#	Gas velocities	
#	Flow rates	
#	Duct pressures	
#	Error percentage ranges	Preferably max range less than 25%
	Note mechanical flow counter gas flow reading on analyser after sampling	litres
	Remove probe from sampling nozzle and re-blank nozzle	
	Remove sampling nozzle probe head from probe assembly, ensuring particles are collected inside filter by tapping S-tube appropriately	
	Empty cooling water of cooler using built in pump into jerry cans	
	Switch off equipment	
	Dismantle pipe work and all electrical cables	
	Re-pack equipment ready for handling back to laboratory	
<b>Tasks to be carried out at office &amp; laboratory</b>		
	Advise STO to send employees to collect equipment from site	
	Advise GO about completion of test	
	Dismantle thimble filter from holder and check for any anomalies, such as water or other residues	
	Take a preliminary check of thimble weight prior drying	grams
	Dry thimble for the same duration and measure dry weight after test.	grams
	Collect data about Boiler and Fuel conditions during test from GO and laboratory	
	Enter data in Report Form	Refer to <b>Appendix IV</b>

## APPENDIX II: PROCEDURE FOR FLUE GAS SAMPLING

### *On Site (Ducting) measurements using GreenLine 8000*

PROCEDURE		REMARKS
<b>Equipment required at sampling site on duct</b>		
1	GreenLine 8000 gas analyser unit (MCU: Main Control Unit)	
2	GreenLine 8000 remote control unit (RCU) inside MCU case c/w interface cable to MCU	
3	Gas sampling probe	
4	Heated gas sampling hose	
5	Associated electrical cables and extension leads	
6	Associated flexible tubing	
7	2 off 24mm open jaw spanners	
8	Probe adaptor flange to fit sampling nozzle on ducting	
<b>Tasks to be carried out at Office</b>		
	Inform Generation Officer about sampling requirement indicating which Boiler in order to maintain steady loading conditions and not carrying out any soot blowing	
	Advise STO (Mechanical Plant) to send employees to transport equipment to sampling site, if necessary	
<b>On Site: Equipment Preparation prior sampling</b>		
	Place analyser next to or just above sampling point, ensuring safety of access and protection of equipment	
	Prepare electric extension cable from nearest power point and connect to analyser using analyser power cable	
	Loosen blank flange from sampling nozzle and instead bolt up probe adaptor flange	
	Insert sampling probe and position by adjusting positioning cone	Position probe in stack as per ISO Standard requirements
	Connect gas connection of sampling probe to gas inlet of heated hose, ensuring gas-tightness.	
	Connect electrical connections of sampling probe to heated hose: <ul style="list-style-type: none"> <li>Probe heater connection</li> <li>Probe temperature sensor</li> </ul>	
	Connect gas outlet of heated hose to gas inlet of MCU, ensuring gas-tightness	
	Connect electrical connection of heated hose to MCU: <ul style="list-style-type: none"> <li>Probe heater connection</li> <li>Probe temperature sensor</li> </ul>	
	Connect MCU to RCU with appropriate extension cable using RS422 jack	
<b>On Site: Setting up Analyser</b>		
	Switch on analyser MCU & RCU	
	Start set-up of analyser procedure including the auto zero routine, and entering/checking data references as necessary in the set-up menu, including mainly:	
1	Date and time of sampling	Various
2	Type of fuel	Various
3	Fuel parameters	If necessary



PROCEDURE			REMARKS
	4	O <sub>2</sub> reference value, depending on type of plant being measured (Steam Boiler or CCGT) and type of fuel being used	% Value: 3% Boilers, 15% CCGT for liquid fuels
	5	Engineering units used	ppm or mg/m <sup>3</sup> , °C or °F, pressure units, others
<b>On Site: Carrying out test</b>			
		Start sampling test from RCU	
		Note measured readings for SO <sub>2</sub> and NO <sub>2</sub> . Note: SO <sub>2</sub> readings take longer to settle	
		When readings on RCU have stabilised, take note of readings and print report on RCU	Approximately 15 min.
		Disconnect MCU from process	
		Switch the MCU off leaving the RCU on. The MCU unit begins a purging process of about 2 minutes and countdown is displaced on RCU. When the process ends the MCU pump switches off	
		Switch off RCU.	
		Remove sampling probe from sampling nozzle and re-bolt blank flange on nozzle.	
		Disconnect and re-pack all equipment ready for handling back to laboratory	
		Note: It is advisable to purge analyser using fresh air as the source if test is run for a second and other consecutive turns, in order to re-zero the sampling cells, by letting fresh air intake at gas inlet prior running test.	
<b>Tasks to be carried out at office &amp; laboratory</b>			
		Advise STO to send employees to collect equipment from site	
		Advise GO about completion of test	
		Collect data about Boiler and Fuel conditions during test from GO and laboratory	
		Enter data in Report Form	Refer to <b>Appendix V</b>

## General Note:

### *On On-site measurement remotely using installed heated sampling line for online automated measuring system:*

When the plant concerned has installed heated sampling lines for online automated measurement of flue gases concentrations the *GreenLine 8000* manual analyser can also be used to carry out the tests by tapping from the gas line entering the automated equipment at ground level, remotely from the flue gas ducting. Hence this approach will do away with the need to install the sampling probe.

This approach will involve connecting flexible gas tubing to the connection point on the panel (in lieu of the probe), ensuring that the gas suction pump on the panel is switch on when carrying out the test in order to assist the peristaltic pump installed in the MCU.

This approach is only justified if the results will be consistent with results obtained as detailed in the procedure above.

### APPENDIX III: EMISSIONS MEASUREMENT DATA FORM

DETAILS	UNITS	VALUES
Date		
Time		
Barometric Pressure		
Site		
Boiler Number		
Position		
<b>Stack Description</b>		
Shape	Round/Rect.	
Diameter or L x B	mm	
Angle	Degrees	
Probe Distance 1	mm	
Probe Distance 2	mm	
Probe Distance 3	mm	
Probe Distance 4	mm	
Probe Distance 5	mm	
<b>Stack Conditions</b>		
Stack Inlet Temperature	°C	
O <sub>2</sub>	%	
SO <sub>2</sub>	ppm	
NO <sub>x</sub>	ppm	
CO	ppm	
CO <sub>2</sub>	%	
NO <sub>2</sub>	ppm	
<b>Boiler Conditions</b>		
Load	MW	
Steam Flow	T/h	
Number of Burners		
Fuel Flow to Burners	T/h	
Fuel Temperature	°C	

DETAILS	UNITS	VALUES
Fuel Pressure	Bar	
O2 Furnace Outlet	%	
FD Fan	% Open	
ID Fan	% Open	
Atomising Steam Pressure	Bar	
<b>Particulates</b>		
Duration of Analysis	min	
Nozzle Diameter	mm	
Trip Counter Before	L	
Trip Counter After	L	
Filter Paper Before	g	
Filter Paper After	g	
Volume of water collected	mL	

**NOTE:** Form is the one developed by DPS laboratory staff.

## APPENDIX IV: PARTICULATE MATTER (DUST) REPORT FORM

(Showing typical data. Form is the one developed by DPS laboratory staff.)

### Particulates Report

Date 6/19/2006  
 Time 10:21 - 11:39  
 Barometric Pressure 766  
 Site Delimara  
 Boiler Number 1  
 Position After Gas/Air Heater  
 Fuel Oil Ruby

Boiler Conditions			Stack Conditions		
Load	MW	58	Stack Inlet Temperature	°C	164
Steam Flow	T/h	243	O <sub>2</sub>	%	2.7
Number of Burners		6	CO <sub>2</sub>	%	10.02
Fuel Flow to Burners	T/h	15.3	Average Velocity	m/s	18.65
Fuel Temperature	°C	115	Fuel Data		
Fuel Pressure	Bar	-			
O <sub>2</sub> Furnace Outlet	%	1.02	Density @ 15°C	Kg/m3	987
FD Fan A	Nm <sup>3</sup> /hr	841	Sulphur Content	%(m/m)	1.00
FD Fan B	Nm <sup>3</sup> /hr	884	Pour Point	°C	3
Atomising Steam Pressure	Bar	-	Flash Point	°C	104
CO <sub>2</sub> Furnace Outlet	%	-	Carbon Residue	%(m/m)	13.7
Particulates			Water and Sediment	%(V/V)	0.1
Duration of Analysis	min	43.44	Ash Content	%(m/m)	0.03
Nozzle Diameter	mm	6	Nickel - Vanadium	mg/Kg	32 - 23
Trip Counter Before	L	8151	Sodium content	mg/Kg	46
Trip Counter After	L	8835	Asphaltenes content	mg/Kg	7.80
Intake Volume Gas meter	NL	612.88	Hydrogen Sulphide	mg/Kg	-
Filter Paper Before	g	2.9550	HFT	%(m/m)	0.07
Filter Paper After	g	3.0296	Viscosity @ 50°C	cSt	415
Volume of water collected	mL	70	Net Calorific Value	Kcal/Kg	9,705
Number of Points Sampled		3	Results Normalised at 3% Oxygen 273 °K		
Probe Distance 1	mm	600	Temperature	°K	273
Probe Distance 2	mm	1150	O <sub>2</sub>	%	3
Probe Distance 3	mm	1650	Particulates	mg/Nm <sup>3</sup>	120
Stack Description			Flue Gas Water content	g/Nm <sup>3</sup>	114
Shape	Round/Rect	Rectangular	Estimated Error	%	>>25
Diameter or L x B	mm	1550 x 4200			
Area	mm <sup>2</sup>	6510000			

Remarks:

**APPENDIX V: EMISSION GASES REPORT FORM**

(Showing typical data. Form is the one developed by DPS laboratory staff.)

*Flue Gas Analysis Report*

Date 11/21/2005  
 Time 14:25 - 15:17  
 Site Delimara  
 Boiler Number 2  
 Position After Gas/Air Heater  
 Fuel Oil Ruby

Boiler Conditions			Stack Description		
Load	MW	59	Shape	Round/Rect	Rectangular
Steam Flow	T/h	239	Diameter or L x B	mm	1550 x 4200
Number of Burners		6	Area	mm <sup>2</sup>	6510000
Fuel Flow to Burners	T/h	14.9	Stack Conditions		
Fuel Temperature	°C	117	Duration of Analysis	min	45.02
Fuel Pressure	Bar	8.5	Number of Points Sampled		1
O <sub>2</sub> Furnace Outlet	%	3.93	Probe Distance 1	mm	
FD Fan A	Nm <sup>3</sup> /hr	876	Probe Distance 2	mm	
FD Fan B	Nm <sup>3</sup> /hr	886	Probe Distance 3	mm	
Atomising Steam Pressure	Bar	-	Stack Inlet Temperature	°C	151.1
CO <sub>2</sub> Furnace Outlet	%	12.9	Net Efficiency	%	
Fuel Data			Combustion Air Control	λ	
Density @ 15°C	Kg/m <sup>3</sup>	987	O <sub>2</sub>	%	3
Sulphur Content	%(m/m)	1.00	SO <sub>2</sub>	mg/m <sup>3</sup>	1618
Pour Point	°C	3	NO <sub>x</sub>	mg/m <sup>3</sup>	573
Flash Point	°C	104	CO	mg/m <sup>3</sup>	0
Carbon Residue	%(m/m)	13.7	CO <sub>2</sub>	%	14
Water and Sediment	%(V/V)	0.1	NO <sub>2</sub>	mg/m <sup>3</sup>	0
Ash Content	%(m/m)	0.03	Normalised Conditions		
Nickel - Vanadium	mg/Kg	32 - 23	Temperature	°K	273
Sodium content	mg/Kg	46	O <sub>2</sub>	%	3
Asphaltenes content	mg/Kg	7.80	SO <sub>2</sub>	mg/Nm <sup>3</sup>	1609
Hydrogen Sulphide	mg/Kg	-	NO <sub>x</sub>	mg/Nm <sup>3</sup>	570
HFT	%(m/m)	0.07	CO	mg/Nm <sup>3</sup>	0.0
Viscosity @ 50°C	cSt	415	CO <sub>2</sub>	%	14
Net Calorific Value	Kcal/Kg	9,705	NO <sub>2</sub>	mg/Nm <sup>3</sup>	0.0
			NO <sub>2T</sub>	mg/Nm <sup>3</sup>	874

**Remarks: Fuel data is that provided by vessel's Certificate of Quality**

## APPENDIX VI: ACCEPTABLE EMISSION LIMIT VALUES FOR MARSA & DELIMARA POWER STATIONS

Plant Reference	Type	Turbine Capacity	Commissioning year	Thermal Capacity	Dust (Particulates)	SO <sub>2</sub>	NO <sub>x</sub>
		MW		MWth	mg/Nm <sup>3</sup>	mg/Nm <sup>3</sup>	mg/Nm <sup>3</sup>
<b>Marsa</b>							
3 <sup>17</sup>	Steam	30	1970	220	50	1700	450
4	Steam	30	1970				
5 <sup>18</sup>	Steam	30	1982	240	50	1700	450
6	Steam	30	1983				
7	Steam	30	1984	250	50	1700	450
8	Steam	60	1987	250	50	1700	450
<b>Delimara</b>							
1 <sup>19</sup>	Steam	60	1991	380	50	1180	450
2	Steam	60	1992				
3A	CCGT	37	1995	121	50	1700	450
3B	CCGT	37	1995	121	50	1700	450

### GENERAL NOTES:

1. Values are based on the requirements indicated in *Article 4(1) and (3)* and *ANNEX IV* (part A), *ANNEX VI* (part A), and *ANNEX VII* (part A) of *EU Directive 2001/80/EC (LCP Directive)*.
2. Indicated values are those that are to be achieved by 1<sup>st</sup> January 2008.
3. Values are based on existing plants having a rated thermal power input greater than 50MWth but not exceeding 300MWth.

<sup>17</sup> Marsa Plants Nos. 3 and 4 are considered as one unit since they exhaust from a common stack.

<sup>18</sup> Marsa Plants Nos. 5 and 6 are considered as one unit since they exhaust from a common stack.

<sup>19</sup> Delimara Plants Nos. 1 and 2 are considered as one unit since they exhaust from a common stack.

## APPENDIX VII: REVIEW RECORD FORM





Revision No.	Prepared or requested by	Reviewed by	Approved by	Date	Amendments
Original	Ing. C. Brincat	Dr. Ing. J. Vassallo Mr. M. Aquilina <i>[Others, as necessary]</i>			
1					
2					
3					
4					
5					
6					
7					

### REMARKS:

1. This record form is useful for traceability of changes/amendments in the methodology manual.
2. Details about amendments should list only the relevant clause reference number/s.

## APPENDIX VIII: LIST OF CERTIFICATES AND OR DECLARATIONS OF CONFORMITY & QUALITY ASSURANCE OF SAMPLING EQUIPMENT

### 1. ZAMBELLI: EC Conformity Declaration

 <b>zambelli</b> Strumenti per il controllo della qualità dell'aria	   ISO 9001 - Cert. n° 0550 Sistema Qualità Certificato	
Cap. Soc. € 260.000,00 int. vers. - C.C.I.A.A. Milano 1059118 - Reg. Trib. di Milano 201694/5639/44 - C.F. e P. IVA: 04890620158 Zambelli srl - SEDE LEGALE: Via G.Rita 11/13 - 20010 Bareggio (MI) - SEDE OPERATIVA: Via Torino, 14 - 20010 Bareggio (MI) Commerciale: Tel.+39.02.90361324/5 - Fax.+39.02.90361249 - Assistenza Tecnica: Tel.+39.02.90361155 - INTERNET: www.zszambelli.com - E-MAIL: info@zszambelli.com		
<h3><u><b>EC CONFORMITY DECLARATION</b></u></h3>		
<b>MANUFACTURER: Zambelli S.r.l.</b> Via Torino, 14 - 20010 Bareggio (MI) Tel. 02/90361324 – Fax 02/90361249		
Zambelli S.r.l. with head office placed in via Torino, 14 - 20010 Bareggio (Milan - Italy) hereby declare under their exclusive responsibility that the automatic "isokinetic" unit model <b>6000 ISOPLUS</b> serial number _____ produced by their firm and assigned to the air sampling is in compliance with what established by the Directives:		
EC/98/37	Machines Directives	
EEC/89/336	Electromagnetic compatibility Directive	
EEC/73/23	Low Voltage Directive	
STRUMENTO	CODICE - MODELLO	
Automatic "isokinetic" unit	PF 11061 – 6000 ISOPLUS	<input type="checkbox"/>
	PF 11061C – 6000 ISOPLUS (EXTERNAL PUMP EXCLUDED)	<input type="checkbox"/>
UNI EN 12919	Working ambient atmosphere Sampling pumps with flow rates upper than 5 l/min for chemical components	
<b>PARTICULAR INSTRUCTION :</b> Follow carefully what indicated in the manual of instruction.  Bareggio, 19/09/2006		
<b>zambelli srl</b> Administrator Giorgio Zambelli		
Conformity declaration, code: SL ZAMBELLI CONFORMITY CERTIFICATE File: [2006/cor/J] d:\documents and settings\josevas.enedomain\my documents\documents_jv\jv_enemalta_files\eu affairs\new approach\zambelli conformity certificate.doc		



## 2. ZAMBELLI: UNI EN ISO 9001: 2000 ICIM Certificate



**CERTIFICATO n. 0599/3**  
**CERTIFICATE No.**

SI CERTIFICA CHE IL SISTEMA DI GESTIONE PER LA QUALITA' DI  
 WE HEREBY CERTIFY THAT THE QUALITY MANAGEMENT SYSTEM OPERATED BY

**ZAMBELLI S.r.l.**

UNITA' OPERATIVE  
 OPERATIVE UNITS

Via Torino, 14 - 20010 Bareggio (MI)  
 Italia

E' CONFORME ALLA NORMA  
 IS IN COMPLIANCE WITH THE STANDARD

**UNI EN ISO 9001:2000**

PER LE SEGUENTI ATTIVITA'  
 FOR THE FOLLOWING ACTIVITIES

**EA: 19**

Progettazione, produzione e assistenza  
 di strumenti per il controllo della qualità dell'aria.  
*Design, production and assistance  
 of instruments for air quality control.*

Riferirsi al Manuale della Qualità per l'applicabilità dei requisiti della Norma ISO 9001:2000.  
 Refer to Quality Manual for details of application to ISO 9001:2000 requirements.

Il presente certificato è soggetto al rispetto del regolamento per la certificazione dei sistemi di gestione per la qualità delle aziende.  
 The use and the validity of this certificate shall satisfy the requirements of the rules for the certification of company quality management systems.

Data emissione First issue 21/10/1996	Emissione corrente Current issue 21/10/2005	Data di scadenza Expiring date 20/10/2008
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**ICIM S.p.A. - PIAZZA A. DIAZ, 2 - 20123 MILANO**

CISQ is a member of



www.ionet-certification.com

IONet, the association of the world's first class certification bodies, is the largest provider of management System Certification in the world. IONet is composed of more than 30 bodies and counts over 150 subsidiaries all over the globe.



SQC N° 0044  
 SGA N° 0050  
 PPD N° 0040  
 SCS N° 0062

CISQ è la Federazione Italiana di Organismi di Certificazione dei sistemi di gestione aziendale

CISQ is the Italian Federation of management system Certification Bodies



www.cisq.com

### 3. ZAMBELLI: ISO 9001: 2000 IQNet Certificate



THE INTERNATIONAL CERTIFICATION NETWORK

# CERTIFICATE

IQNet and its partner  
CISQ/ICIM  
hereby certify that the organization

**ZAMBELLI S.r.l.**  
**Via Torino, 14 - I-20010 Bareggio (MI)**

for the following field of activities

**Design, production and assistance of instruments for air quality control.**

has implemented and maintains a  
**Quality Management System**  
which fulfills the requirements of the following standard

**ISO 9001:2000**

Issued on: **2005-10-21**  
Validity date: **2008-10-20**  
Registration Number: **IT-7967**




**Fabio Roversi**  
*President of IQNet*




**Gianrenzo Prati**  
*President of CISQ*



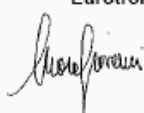

IQNet Partners\*:

AENOR Spain AFAQ France AIB -Vincotte International Belgium ANCE Mexico APCER Portugal CISQ Italy CQC China CQM China  
CSQ Czech Republic Cro Cert Croatia DQS Germany DS Denmark ELOT Greece FCAV Brazil FONDONORMA Venezuela  
HKQAA Hong Kong ICONTEC Colombia IMNC Mexico IRAM Argentina JQA Japan KEMA Netherlands KFQ Korea MSZT Hungary  
Nemko Certification Norway NSAI Ireland OQS Austria PCBC Poland PSB Certification Singapore QMI Canada RR Russia  
SAI Global Australia SFS Finland SII Israel SIQ Slovenia SQS Switzerland SRAC Romania TEST St Petersburg Russia  
YUQS Serbia and Montenegro

IQNet is represented in the USA by the Following partners: AFAQ, AIB - Vincotte International, CISQ, DQS, KEMA, NSAI, QMI and SAI Global

\*The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under [www.iqnet-certification.com](http://www.iqnet-certification.com)

#### 4. EUOTRON: Declaration of Conformity

 <p><b>EUOTRON Instruments S.p.A.</b>  V.le F.lli Casiraghi 409/413  20099 Sesto S. Giovanni (MI) ITALY  Tel.: +39-02 248620.1 - Fax: +39-02 2440286  E-mail: info@eurotron.com</p>	<p><b>CAPITALE SOCIALE:</b> € 520.000 interamente versati  Registro Imprese Tribunale di Milano n° 198001  Nr Mecc. MI042099 - C.C.I.A.A. Milano n° 1050992  Partita I.V.A. e Cod. Fiscale n° 05947400155  VAT Reg. IT 05947400155</p>														
															
<h2 style="margin: 0;">Declaration of Conformity</h2> <p><b>We:</b> Eurotron Instruments Spa  (Supplier's name)</p> <p>Via Casiraghi 409 20099 Sesto S. Giovanni Italy  (address)</p> <p><b>declare under our sole responsibility that the products listed below:</b></p> <table style="margin-left: 40px; border: none;"> <tr> <td>Portable combustion gas analyzer type GreenLine 8000</td> <td style="text-align: right;">cat. 7848</td> </tr> <tr> <td>Portable combustion gas analyzer type EcoLine 6000</td> <td style="text-align: right;">cat. 7846</td> </tr> <tr> <td>Portable combustion gas analyzer type EcoLine 4000</td> <td style="text-align: right;">cat. 7824</td> </tr> <tr> <td>Portable combustion gas analyzer type EcoLine 2000</td> <td style="text-align: right;">cat. 7816</td> </tr> <tr> <td>Portable combustion gas analyzer type UniGas 3000+</td> <td style="text-align: right;">cat. 7823</td> </tr> <tr> <td>Portable combustion gas analyzer type UniGas 2000+</td> <td style="text-align: right;">cat. 7822</td> </tr> <tr> <td>Portable combustion gas analyzer type UniGas 1000</td> <td style="text-align: right;">cat. 7820</td> </tr> </table> <p>to which this declaration relates is in conformity with the European Standards titled "Specification for portable electrical apparatus designed to measure combustion flue gas parameters of heating appliance":</p> <p>EN 50379-1 Part 1 General requirements and test methods ( valid for all models )  EN 50379-2 Part 2 Performance requirements for apparatus used in statutory inspections and Assessment ( valid for all models excluding UniGas 1000 with ordering code table B=2 )  EN 50379-3 Part 3 Performance requirements for apparatus used in non-statutory servicing of gas fired heating appliances ( valid for all models )</p> <p>The following Normative Reference are also applicable and the above indicated equipments are declared in Conformity also with the Standards listed below:</p> <p>EN 50270 EMC compatibility – Apparatus to measure combustible or toxic gases or oxygen  EN 50271 Apparatus to measure combustible or toxic gas or oxygen. Requirement and tests for apparatus using software and/or digital technologies  EN 60335-1 (1994) Safety of household and similar electrical appliance Part 1: General requirements.  EN 60359 (2002) Electrical and electronic measurement equipment – Expression of performance  EN 60529 (1991) Degree of protection provided by enclosures (IP Code)</p> <p>Eurotron has found that all listed equipments are in conformity with the listed Standards and continuing production is assured to conform with the indicated specifications and standards</p> <p>Sesto S. Giovanni, January 1st, 2006</p> <div style="text-align: right; margin-top: 20px;"> Eurotron Instruments Spa   </div> <div style="text-align: right; margin-top: 20px;">  </div>		Portable combustion gas analyzer type GreenLine 8000	cat. 7848	Portable combustion gas analyzer type EcoLine 6000	cat. 7846	Portable combustion gas analyzer type EcoLine 4000	cat. 7824	Portable combustion gas analyzer type EcoLine 2000	cat. 7816	Portable combustion gas analyzer type UniGas 3000+	cat. 7823	Portable combustion gas analyzer type UniGas 2000+	cat. 7822	Portable combustion gas analyzer type UniGas 1000	cat. 7820
Portable combustion gas analyzer type GreenLine 8000	cat. 7848														
Portable combustion gas analyzer type EcoLine 6000	cat. 7846														
Portable combustion gas analyzer type EcoLine 4000	cat. 7824														
Portable combustion gas analyzer type EcoLine 2000	cat. 7816														
Portable combustion gas analyzer type UniGas 3000+	cat. 7823														
Portable combustion gas analyzer type UniGas 2000+	cat. 7822														
Portable combustion gas analyzer type UniGas 1000	cat. 7820														



## 5. EUROTRON: UNI EN ISO 9001: 2000 GASTEC Certificate

GASTEC hereby declares that the company

**EUROTRON INSTRUMENTS S.p.A.**  
with registered office in Milano - (MI) - Italy

has demonstrated to operate a quality management system

**UNI EN ISO 9001:2000**

on the following activities:

**design, production, sales and after sales-service of gas  
analysis and monitoring equipment,  
test, measurement and calibration equipment  
and systems and non contact infrared thermometers.**

for which the company has instituted and realized  
a quality system at the following site:

- Viale F.lli Casiraghi, 409/413 - 20121 - Sesto San Giovanni - (MI)

The present certificate was issued according to GASTEC procedures.

San Vendemiano, 24th December 2003

  
Daniel Vangheluwe  
Presidente Governing Board

**SINCERT**  
SISTEMI INTEGRATI DI CERTIFICAZIONE E CONTROLLO  
SGQ N° 345A  
Membro della Rete di Sistemi di Certificazione ISO 9001

Date first certification:  
16th May 2001

**GASTEC**

GASTEC Italia SpA. Via Treviso 32/34 ▲ 31020 San Vendemiano (TV) - Italy

**QUALITY ASSURANCE**

CERTIFICATE N° IMV 03.501755-S  
EA 19

Page 1 of 2

# **Attachment 9**

***Tender for Biocide Dosing Services against  
Micro & Macro Fouling***

**Enemalta Ref:**

**TENDER FOR SERVICES TO KEEP CULVERTS, CONDENSERS AND HEAT EXCHANGERS  
FREE OF MICRO AND MACRO FOULING.**

**Offers are invited for the services to dose and keep free of Micro and Macro fouling the culverts, condensers and other heat exchangers at the Marsa Power Station.**

**1.0 Purpose of Tender**

- 1.1 To provide all necessary equipment and chemicals for the dosing of a sea-water anti-fouling system at Marsa Power Station. This system will be designed to keep and maintain the sea-water circuits free from micro and macro fouling. The sea-water circuits are to be taken to be all cooling water and other circuits exposed to sea-water from the seawater intake to the discharge point and includes all screens, headers, pipes, pumps, heat exchangers and condensers.
- 1.2 To provide monitoring equipment to evaluate the effectiveness of the anti-fouling system.
- 1.3 To provide monitoring equipment to determine the levels of residual chemicals and by products of the dosing process at the sea-water outlet, in order to ensure that the levels of chemicals discharged to the marine environment are kept to less than 50% of the limits imposed by local or EU legislation or Directives.
- 1.4 To provide technical support, including system and dosing optimization and maintenance and spare parts for the system (one year supply of consumables and strategic spare parts are to be kept on site). Technical specialists, expert in anti-fouling processes and disinfections, are to supervise the dosing of the anti-fouling treatments, and are to carry out periodic on-site visits (once per 2 weeks for the first three months, subsequently monthly, and to be available on-call in event of system mal-function or failure of the treatment. The dosage rate is to be determined by the Technical specialist, and this is expected to vary according to the prevailing sea-water conditions, flow rate and season.

**2.0 Description of Sea-Water Circuits**

- 2.1 Marsa Power Station can utilize a maximum of 43,300 m<sup>3</sup>/hr of sea-water for cooling of the steam turbine condensers and auxiliary heat exchangers, and

approximately 300m<sup>3</sup>/hr for seawater evaporators. However, the average daily sea-water cooling flow is 33,000 m<sup>3</sup>/hr. Enemalta will inform the supplier of any plant taken out of service or placed in service if this affects the sea-water flow.

The dosing points for the anti-fouling system will be located as close as possible to the sea water intake. Any attachments to the concrete walls are to be made using stainless steel (316) or better fittings only, and precautions must be taken to avoid long term corrosion of the steel reinforcing structure.

A schematic diagram of the culverts and position of units is being attached for reference. A temporary division wall (dam board) is normally fitted between units 4 and 5, such that the South Culvert (Twin) feeds units 5, 6 and 8, while the North Culvert (Main) feeds units 1, 2, 3, 4 and 7. The division wall may be shifted, and additional walls installed, to permit isolation of parts of the culvert for maintenance. The Main Culvert has a cross-sectional area of 6.37m<sup>2</sup>, while the Twin Culvert an area of 7.24m<sup>2</sup>. The latter is divided from the middle by a dividing wall, 3.62m<sup>2</sup> each side.

Seawater from the Grand Harbour is utilized to cool the condensers of the eight conventional steam driven turbo-generators. The seawater temperature varies between 12°C in winter to 30°C in summer. This water passes first through the seawater intake, which prevents any floating or coarse material from entering the culverts. Downstream it passes through seawater screens, which stops other less coarse material. These culverts are constructed in the underlying rock and lined with concrete. The floor level of these culverts is between 5.5m and 6.2m below sea level.

It is the responsibility of the Tenderer to carry out any tests and analyses of the seawater composition, prior to submission of offers. Tenderers will be deemed to have familiarized themselves with the site before submitting tender. State of system before start of service shall be *talequale*.

2.2 The technical characteristics of the components of the sea-water condensers are tabulated below:

<b>Description</b>	<b><u>T/A</u></b> <b><u>1</u></b>	<b><u>T/A</u></b> <b><u>2</u></b>	<b><u>T/A</u></b> <b><u>3</u></b>	<b><u>T/A</u></b> <b><u>4</u></b>	<b><u>T/A</u></b> <b><u>5</u></b>	<b><u>T/A</u></b> <b><u>6</u></b>	<b><u>T/A</u></b> <b><u>7</u></b>	<b><u>T/A</u></b> <b><u>8</u></b>	<b><u>Evaporat</u></b> <b><u>ors</u></b>
Seawater flowrate per pump m <sup>3</sup> /hr	1,300	1,300	3,200	2,700	3,000	3,000	3,000	5,200	150
Number of pumps	2	2	2	2	2	2	2	2	3
Pass	2	2	2	2	1	1	1	3	
Number of tubes	2,008	2,008	5,000	4,200	4564	4564	4564	12,060	
Material of tubes	Aluminium Brass	Aluminium Brass	Aluminium Brass	Aluminium Brass	Aluminium Brass	Aluminium Brass	Aluminium Brass	Aluminium Brass	Stainless 312L
Tube OD mm	25.4	25.4	25.4	25.4	19.05	19.05	19.05	25.4	
Thickness swg	18	18	18	18	18	18	18	18	
Tube length m	6.78	6.78	7.3	7.3	7.98	7.98	7.98	5.86	
ΔP in bar across condenser (sea-water) – maximum	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.42	

### 3.0 **Conditions of Supply**

As stated in the description of purpose, an anti-fouling treatment – disinfection of the sea-water used for the cooling of the steam turbine condensers and other heat exchangers is required. This anti-fouling/disinfection treatment is to conform to the following conditions:

- 3.1 Use of chlorine gas, whether supplied as liquid chlorine in pressurized cylinders or generated on site is not permitted.
- 3.2 For all antifouling treatments, the maximum permitted concentration (residual) of the antifouling chemicals and any by products resulting from the dosing at the outlet of the condensers is to be less than 50% of the current limits set by local or EU legislation/Directives, whichever is the lowest, for discharge into the marine environment. The Supplier shall be responsible for periodically analyzing the composition of the sea-water discharge at the outfall to the marine environment.
- 3.3 At the dosage recommended by the Supplier, the formation of micro and macro fouling is to be inhibited within the complete sea-water circuit. The sea-water circuit is to be taken as all parts exposed to sea-water from the bar screens at the sea-water inlet through all pipe-work, pumps, heat exchangers, condensers to the sea-water outfall. The Supplier shall be responsible for periodic examination and testing of the sea-water in order to establish appropriate dosing rates.



- 3.4 The recommended dosing rates are to keep and maintain the heat transfer capacity of all heat exchangers and condensers at a maximum value with no equipment de-rating.
- 3.5 At 500% of the maximum recommended dosage, the treatment shall not cause corrosion in any of the materials used in the sea-water circuit.
- 3.6 Should the limits, established by local or EU legislation/Directives, be reduced, during the operational period of the contract, the dosing and scope of supply/guarantees shall be modified accordingly.
- 3.7
- 3.8 If the proposed anti-fouling treatment requires that two or more chemicals be mixed (in order to react together) and a gaseous product or by product is generated, and this gaseous product is considered hazardous, then the mixing of the chemicals is to take place underwater, close to the intended dosing point(s). Above ground generation of hazardous gases is not permitted.
- 3.9 The anti-fouling treatment shall not release into the atmosphere any noxious gases, which can be released into the atmosphere, and can be irritating to, or detrimental to the health of the site personnel. The complete process of the anti-fouling treatment shall comply with local health and safety regulations.
- 3.10 If as a result of the anti-fouling treatment, there are discharges (of chemicals, gases or other by-products) which exceed the limits established by local or EU legislation, and as a consequence Enemalta is subjected to penalties or fines, then the Supplier will be bound to reimburse Enemalta these fines/penalties and all associated costs.

#### **4.0 Scope of Supply**

- 4.1 The Supplier will be responsible for determining the optimum dosing rates and durations to keep and maintain the sea-water circuits free of micro and macro fouling and to maintain the units at full capacity with no de-rating
- 4.2 The dosing equipment provided is to be capable of operating fully automatically, although full manual control and monitoring is to be provided.
- 4.3 A complete operations instruction manual is to be provided (10 copies).
- 4.4 An accurate and reliable monitoring system to determine the level of fouling is to be provided. The system provided is to be comprehensively and clearly described

- in the technical documentation submitted to Enemalta for evaluation. All field instrumentation necessary, together with any specialized laboratory instrumentation and chemicals are to be described and included in the scope of supply. The monitoring system may employ electrical/electronic sensor, chemical or biological analysis or any combination of the above.
- 4.5 All necessary chemicals, materials, or instruments, required for the monitoring of the residual concentration of dosed chemical at the outlet of the condensers is to be included in the scope of supply.
- 4.6 All necessary spare parts, as listed in the relevant documentation to be submitted, to ensure an uninterrupted operation of the antifouling treatment plant, at the recommended dosing rates, are to be supplied and kept on site. The entire antifouling plant is to be maintained by the Supplier.
- 4.7 A progress report is to be submitted in electronic form, after every technical visit (every 2 weeks for the first 3 months, subsequently monthly). This report should include as a minimum dosage rates, chemicals consumed, analysis of effectiveness treatment, residuals at discharge, sea-water analysis etc.
- 4.8
- 4.9 All changes in the recommended dosing rates/duration are to be communicated to Enemalta on an agreed format.
- 4.10 The dosing plant and associated installation will conform in all respects to the requirements of local/EU legislation/Directives, whichever are more onerous and to best engineering practice. The Tenderer is to clearly state the limits of supply/terminal points and to identify those services/supplies required from Enemalta.
- 4.11 All chemical storage vessels and pipe-work are to be certified as confirming to the appropriate regulations. All storage vessels are to be located in or above adequate containment areas in order to protect against spillage.
- 4.12 The supplier is to provide a 'telephone hotline' service where problems may be reported and technical advice/assistance provided. A modem connection to the anti-fouling monitoring system is considered desirable.
- 4.13 The level of fouling will also be monitored by means of plaquettes installed in the sea-water circuit as agree with Enemalta Technicians. These plaquettes will be supplied by the supplier of the anti-fouling treatment system and will be of an approved material. The plaquettes will be used to determine penalties to be applied for failure to inhibit the formation of micro and macro fouling. The

number of plaquettes will depend on the number of dosing points and circuits and installed at locations agreed to, prior to commencement of the treatment.

- 4.14 The supplier will provide training in the operation of the dosing and monitoring plant to all operations personnel involved with the sea-water circuit. In particular the following is to be provided.
- (a) Anti-fouling system concept and design, optimization techniques. For operations engineers and supervisors.
  - (b) dosing plant operation, including manual and emergency (in case of malfunction) operation, for all personnel.
  - (c) dosing plant routine maintenance.
  - (d) Safety procedures required to be followed for normal or emergency operation and in the event of chemical spillages, dosing pipeline rupture etc.

Since all operations personnel involved are to be trained, and since these personnel work on 4-shift basis, 4 training sessions each for the above Training will need to be provided by the supplier.

## 5.0 **Duration of Contract**

The duration of this contract for the provision of anti-fouling treatment will initially be for one (1) year extendible at Enemalta discretion up to a maximum of two (2) years. Enemalta may terminate the Contract by giving notification three months prior to the renewal date, otherwise the contract will be renewed automatically. Enemalta may also terminate the contract in the event of persistent or repeated heavily fouling, de-rating of units (defined in section 7) or in the event that any of the guarantees in section 6 are infringed by the Supplier.

## 6.0 **Guarantees**

The following conditions shall be guaranteed.

- 6.1 The proposed anti-fouling treatment system shall keep the sea-water circuits free of micro and macro fouling, in particular all sea-water pipe-work, heat exchangers and condensers.
- 6.2 All chemicals used, and any by products produced as a result of the dosing shall be environmentally acceptable and shall conform to local/EU legislation and directives.

- 6.3 The residual chemicals at the condenser outlet and any produced by products, shall not exceed 50% of the limits established by local/EU legislation/directives which ever are lowest.
- 6.4 The treatment shall not cause corrosion in any materials existing in the plant.
- 6.5 The dosing plant shall be installed using the best available technology and best engineering practice, and shall conform to local/EU legislation and directives. The Tenderer shall guarantee the continued good operation of the anti-fouling treatment dosing equipment and adequate supply of all required chemicals on site.
- 6.6 The fouling monitoring system shall periodically be accurately checked. The monitoring system, together with the plaquettes installed in the sea-water circuit will be used to determine the level of fouling and any consequent penalties to be applied. The plaquettes will be checked periodically – on every technical visit or more frequently if required, in the presence of the Supplier representative or Technical specialist. Photographs will be taken and included in the periodic progress reports.
- 6.7 The Tenderer shall complete and submit a schedule of guarantees, where the maximum guaranteed discharge level of the anti-fouling treatment chemicals or by-products is stated. The maximum recommended dosing rate is to be stated.
- 6.8 The Supplier shall deposit a Bank guarantee in an approved form for the value of 10% of the first two years contract for the anti-fouling treatment, based on the quoted rates and sea-water flow-rates of 33,000m<sup>3</sup>/hr.
- 6.9 The turbine condenser tubes are kept clean and the units can operate at their full nominal capacity without having to operate at low vacuum or without having to de-rate the turbine output because of low vacuum.

7.0 **Penalties**

Plaquettes will be placed in the sea-water circuit, at locations agreed to prior to commencement of the dosing. These plaquettes will be examined periodically and the following information recorded and trended:

- (a) percentage increase in weight
- (b) percentage area with visible Bioforms
- (c) surface bacteria count per cm<sup>2</sup>

The presence of visible Bioforms on the surface of the plaquettes will be considered as a failure of the antifouling treatment system to inhibit both micro and macro fouling. Each plaquette will measure approx. 200cm<sup>2</sup> surface area (per side) giving a total surface area of  $\simeq$  400cm<sup>2</sup>. The plaquettes shall be removed for inspection and then returned to the original location. They shall not be replaced periodically, except in case of non-recovery.

- 7.1 Light fouling is defined as the presence of visible Bioforms over an area between 0.1% and 0.2% of the total area of each plaquette in question, over a 14 day period.
- 7.2 Medium fouling is defined as the presence of visible Bioforms over an area between 0.2% and 0.4% of the total surface area of each plaquette in question, over a 14 days period.
- 7.3 Heavy fouling is defined as the presence of visible Bioforms over an area in excess of 0.4% of the total area of each plaquette in question, over a 14 days period.
- 7.4 For light fouling, as defined above, over a period of 14 days, the penalty shall be Lm3000. For light fouling which persists for a second consecutive 14 days, the penalty will be Lm6,500 and the fouling shall be deemed to be medium fouling.
- 7.5 For medium fouling, as defined above, over a period of 14 days, the penalty shall be Lm6,500.  
For medium fouling which persists for a second consecutive 14 day period, the penalty will be Lm15,000, and the fouling shall be deemed to be heavy fouling.
- 7.6 For heavy fouling over a period of 14 days, the penalty shall be Lm15,000.  
Should the heavy fouling persist or should there be repeated incidents of heavy fouling, Enemalta shall reserve the right to terminate the contract as described in clause 7.8.
- 7.7 If units are de-rated due to low vacuum because of fouling or dirty condenser tubes, the following penalties will apply:

a.	For Unit Nominal Rating 60MW	Lm 2000 per day
b.	For Units Nominal Rating 30MW	Lm 1000 per day
c.	For Units Nominal Rating 10MW	Lm 350 per day
- 7.8 In the event of persistent or repeated heavy fouling, the antifouling treatment shall be considered to be unsuccessful. In this case the following conditions shall apply:
  - 7.8.1 Enemalta reserves the right to terminate the contract.

- 7.8.2 The Supplier is obliged to remove all dosing equipment and related installations from the site at his own expense. The site is to be made good as originally taken over by the supplier.
- 7.8.3 The supplier is obliged to either clean the fouled sea-water system and bring them to the original condition, at his own expense, or failing this, Enemalta shall carry out or sub contract the works at the Suppliers expense.
- 7.8.4 Any and all costs incurred by Enemalta as a result of the failure of the anti-fouling treatment system, including lost generation, reduced efficiencies and any additional generation costs shall be reimbursed by the supplier.

## **8.0 Documents to be Submitted with Tender**

- 8.1 Engineering design specification of the dosing equipment, including types and manufacturers of critical components and schematics showing clearly the process connections.
- 8.2 Design calculations based on analysis of seawater for the appropriate/ recommended dosing rate.
- 8.3 Proposed method of monitoring the performances of the antifouling treatment, i.e monitoring that the development of micro and macro fouling is effectively inhibited. The proposed method will be subject to evaluation and approval by Enemalta. The proposed method must be supported by adequate technical documentation to permit this evaluation and must additionally include references and/ or case studies if available.
- 8.4 Reference list (including contact details) of installations where the antifouling treatment has been used, particularly for the large scale sea-water applications in the Mediterranean Sea.
- 8.5 Case studies, if available, of the effect on the Marine environment of the use of the proposed seawater anti-fouling treatment.
- 8.6 Test results by an independent laboratory that the anti-fouling treatment when used at 500% of the maximum recommended dosage causes no corrosion on any of the materials in the sea-water circuit. The maximum recommended dosing rate shall be that given in the schedule of guarantees.

- 8.7 The laboratory/field analysis procedure to monitor the chemical discharges to the marine environment. Monitoring of the residual is to be either on-line or periodic (during dosing).
- 8.8 Draft operation and Maintenance manual, including lists of recommended spare parts and the expected maintenance program.
- 8.9 Full details of all chemicals used, including Material Safety Data Sheets, Technical data sheets and Certification by an Independent authority that the chemical is safe for use and conforms to EU standards.
- 8.10 Earliest commencement date (after award of contract) and bar chart giving installation and commissioning program.
- 8.11 Schedule of Technical Assistance.
- 8.12 Schedule of Training.
- 8.13 Schedule of Guarantees.

## **9.0 Price Schedule**

Treatment per 1,000,000 m<sup>3</sup> of seawater flow. The Tenderer should also submit a price schedule based on a fixed rate for treating 1,000,000m<sup>3</sup> of seawater for the 1<sup>st</sup> year and for the 2<sup>nd</sup> year treatments.

To calculate the monthly rate the following will be taken into consideration. Any operational changes will be communicated to the supplier as soon as changes are effected or planned:

- a. The number of hours a unit remains in service.
- b. The number of circulating pumps on each unit in service.
- i.e. If the cost is Lm X per 1,000,000 m<sup>3</sup> and the following units are in service than the amount due after one month of say 31 days will be calculated as follows:

Unit	CWPs	Flow per CWP	Month (31 days)	Flow
		m <sup>3</sup> /hr	hrs	m <sup>3</sup> x 10 <sup>6</sup>
EVO	A	150	744	0.112
EVO	B	150	200	0.03
EVO	C	150	0	0
TA1	A	1300	0	0
TA1	B	1300	0	0
TA2	A	1300	0	0
TA2	B	1300	0	0
TA3	A	3200	744	2.381
TA3	B	3200	744	2.381
TA4	A	2700	303	0.818
TA4	B	2700	303	0.818
TA5	A	3000	444	1.332
TA5	B	3000	200	0.600
TA6	A	3000	744	2.232
TA6	B	3000	744	2.232
TA7	A	3000	744	2.232
TA7	B	3000	744	2.232
TA8	A	5200	744	3.869
TA8	B	5200	744	3.869
			Total	25.138

Hence, the amount due is = Lm 25.138 x X

### **SCHEDULE**

<b><u>Item</u></b>	<b><u>Description</u></b>	<b><u>Amount (Inc V.A.T)</u></b>
1	Price rate for treating 1,000,000 m <sup>3</sup> of seawater for the 1 <sup>st</sup> year.	
1	Price rate for treating 1,000,000 m <sup>3</sup> of seawater for the 2 <sup>nd</sup> year.	

### **SPECIAL CONDITIONS OVERLEAF**