

Approved by: P. Vlăsceanu

Checked by: V. Bologa

Prepared by: A. Boscornea

## Construction of Sulfur Recovery Unit 3

### PROCESS DATA SHEET

#### MIXERS PACKAGE 304-X-302/304-X-303

Project Phase: DTDE

Project No.: 1267PJ

Client: S.C. PETROTEL - LUKOIL S.A.

Site Location: Ploiești, Prahova, Romania

LUDAN Engineering S.R.L.

**MASTER**

Discipline: Process

Name: V.Bologa Sign.

Date: 18.10.2019

WP-UE1-002-F11-REV.3.1

Revision	Date	Revision description
0	28.02.2018	First Issue
1	28.03.2018	Second Issue
2	10.04.2018	Third Issue
3	20.02.2019	Revision after client's comments - general revision
4	14.03.2019	Revision after client's comments
5	18.10.2019	Revision after client's comments

<b>ITEM: Static Mixer 304-X-302/304-X-303</b>		<b>SERVICE :</b> Air - liquid sulfur static mixer		<b>REV.</b>
<b>NUMBER REQUIRED</b> 2		<b>NUMBER OPERATING:</b> 2 (1 for each degassing pump)		
<b>OPERATING CONDITIONS</b>				
<b>INLET</b>				
<b>STREAM 1</b>				
Type of Fluid		INSTRUMENT AIR		
Inlet Pressure (Note 1)	kPa g	300		
Temperature	°C	120		
Density	kg/m3	3.99		
Molecular Weight	mol/g	28.9		
Viscosity	cP	0.0217		
Flow-rate	kg/hr	23.2	per mixer	
<b>STREAM 2 (Note 5)</b>				
Type of Fluid		SULFUR		
Pressure (Note 1)	kPa g	300		
Temperature	°C	150		
Density	kg/m3	1790		
Molecular Weight		256		
Viscosity	cP	8		
Flow-rate (Sulfur degassing pump capacity)	kg/hr	62650	per mixer	
<b>DISCHARGE</b>				
Type of Fluid		MIXTURE OF SULFUR AND AIR		
Pressure (Note 3)	kPa g.	Vendor can use maximum pressure drop (up to 300 kPa)		
Temperature	°C	150		
Velocity	m/s	By vendor		
Miscellaneous				
Location		Sulfur degassing pump discharge to pit.		
<b>MATERIALS OF CONSTRUCTION</b>				
BODY		Full Steam jacketed CS pipe (steam jacket flange to flange). (Note 2)		
NOZZLE		By vendor (150# RF).		
INTERNALS		By vendor.		
<b>DESIGN CONDITIONS</b>				
Design Pressure	barg	4,4 (process) 7,0 + FV (steam jacket)		
Design Temperature	°C	250 (process) 250 (steam jacket)		
<b>NOTES</b>				
(1) To be confirmed by Vendor (2) Mixers to be Steam Jacketed with LP steam at 152 °C, 3,5 barg. (Design conditions: 250 °C, 7 barg/FV) (3) To be defined by Vendor (4) Hydrogen sulfide concentration: pit inlet ~300 ppm, after degassing max. 10 ppm. (5) Sulfur degassing pumps 304-P-301A and 304-P-301B on page 4. Pump discharge peressure: 3,5 barg (normal). (6) Transmitter signals: 4-20 mA HART. (7) Sulfur degassing pit compartment volumes: Rundown and calming section: 36 m3 degassing section: 73 m3 Storage section: 125 m3.				

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Aprobat,  
Membru al Directoratului – Inginer Sef  
Dan Danulescu

PROCES VERBAL  
DE AVIZARE A DOCUMENTATIEI TEHNICO-ECONOMICE

Proiectant: LUDAN ENGINEERING

Obiectiv: Complex Recuperare Sulf 3 – Contract nr. 513/29.12.2017

Denumirea documentatiei analizate si avizate:

1. Transmittal nr. 1267PJ-TR-61/11.02.2020:
  - 1.1. REQUEST FOR QUOTATION SULPHUR TRAPS – nr. 1267PJ-UE143-000-011, rev. 1;
  - 1.2. PROCESS DATA SHEET SULPHUR TRAPS – nr. 1267PJ-UE117-303-SS1, rev.4;
2. Transmittal nr. 1267PJ-TR-63/13.02.2020: + 1267PJ-TR-65/18.02.2020
  - 2.1. REQUEST FOR QUOTATION CATALYST INJECTION PACKAGE – nr. 1267PJ-UE143-000-013, rev.0;
  - 2.2. PROCESS DATA SHEET CATALYST INJECTION PACKAGE 304-X-301 – nr. 1267PJ-UE117-304-X-301, rev.6
  - 2.3. REQUEST FOR QUOTATION MIXERS PACKAGE – nr. 1267PJ-UE143-000-012, rev.0;
  - 2.4. PROCESS DATA SHEET MIXERS PACKAGE 304-X-302/304-X-303 – nr. 1267PJ-UE117-304-X-302/304-X-303, rev.5;
  - 2.5. SAFETY DATA SHEET MORPHOLINE – BASF.

Participanti:

Numele si prenumele	Funcția
Y.I.Erogo	Director Reparatii si Mentenanta Utilaje
Catalin Niculescu	Tehnolog Sef
Makushev Denys	Sef Birou Echipamente Mecanice – Ing. Sef Mecanic
Valentin Alexandru	Sef Serviciu Inspectie Echipamente & Fiabilitate
Musat Ionut	Sef Proiect
Coman Ion	Specialist pregatire documentatia

In urma analizarii documentatiei, s-a decis ca nu sunt observatii si i se va aplica stampila “BUN DE EXECUTIE”, dupa care se va transmite la Serviciul Suport Proiecte de Constructii.

Semnaturi:

Numele si prenumele	Semnatura	Data
Y.I.Erogo		
Catalin Niculescu		18.02.2020
Makushev Denys		18.02.2020
Valentin Alexandru		
Musat Ionut		
Coman Ion		

Approved: P. Vlasceanu

Checked: V. Bologa

Prepared: A. Boscornea

## Construction of Sulfur Recovery Unit 3 REQUEST FOR QUOTATION (RFQ)

### MIXERS PACKAGE

(THIS IS NOT AN ORDER)

Project Phase: DTDE

Project No.: 1267PJ

Client: S.C. PETROTEL - LUKOIL S.A.

Site Location: Ploiesti, Prahova, Romania



LUDAN Engineering S.R.L.

**MASTER**

Discipline: PROCESS

Name: V.Bologa Semnatura:

Date: 12.02.2020

WP-PR-001-F01-REV.2.0

Revision	Date	Revision description
0	12.02.2020	First issue. For procurement.

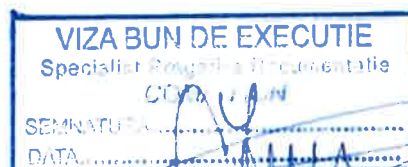


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## Construction of Sulfur Recovery Unit 3

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## Construction of Sulfur Recovery Unit 3

### FOREWORD

This document constitutes a request for quotation from your company for the products, materials, equipment, and representative technical services listed in **Table 1**.

They must meet the specifications, data sheets, terms and conditions, instructions to the vendor, and all attached reference documentation, which may be amended or completed.

This document may be used by **Ludan Engineering S.R.L** as its owner or may be used for the benefit of a client of **Ludan Engineering S.R.L**. (as in this case), which we will call the "**Buyer**".

**Bidder** shall carefully review this **Request for Quotation (RFQ)** and shall supply all required information using this form.

**Bidder** declares that it has carefully examined this **RFQ** and all attached applicable documents, and its quotation is complete and responsible.

### CONFIDENTIALITY

This **RFQ** and all other documents listed in **Table 2**, including any other written information, obtained during the process of submitting a quotation, are considered Confidential Information.

**The Bidder** agrees to hold and treat all the Confidential Information in a confidential manner and shall not release or disclose Confidential Information to third parties, without written consent of **Buyer**.

**The Bidder** agrees not to use the confidential information, or any related data and information, for any purpose other than that provided in the quotation.

### ACKNOWLEDGEMENT FOR BID PARTICIPATION

After receiving of this **RFQ**, the potential **Bidder** will submit to **Buyer**, the Acknowledgement by filling the form presented on **Appendix No.1**.

### QUOTATION SUBMITTAL

- Quotations must be received by **Buyer** in the shortest possible time.
- Quotations must be submitted in this form.

The technical information and other required attachments must accompany the quotation and will be attached directly to this form.

- The bidder's total bid price must comply with the applicable specifications and drawings, the terms and conditions of any other document, an integral part of this call for tenders, and must include all the costs of the bidder to deliver the specified: products, materials, equipment, tools and technical services.
- The bidder must include in his tender the documentary evidence of his qualification to execute a contract in its entirety and to provide spare parts and other necessary services required.
- The bidder must include in its offer all the costs associated with the preparation and transmission of the quotation, and the buyer is not liable for these costs if the bidder forgot to include them from the beginning.
- The bidder must check the positions in the offer, so that they reflect the revisions of the bid, that he has received and incorporated in the quotation.
- **Buyer** reserves its right to accept other than the lowest priced quotation, and to accept or reject any quotation or all quotations, in whole or in part.
- The **Buyer** will assess the compliance of the quote with RFQ requirements and deadlines. Being a subject of technical compliance, the quotation can be selected for contractually conformity and commercially acceptable.

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### Construction of Sulfur Recovery Unit 3

Based on the above assessment, the Buyer will determine which quote is the cheapest and technically acceptable one.

## 1 SCOPE

This document was made to receive from the bidders the quotation for the goods, materials, equipment, instruments, and technical service representatives, according to those listed in **Table 1**.

All the goods, materials, equipment, instruments, and technical service will be symbolized with "Product" in **Table 1**.

**TABLE 1**

Crt. No.	Product Description	Product Symbol	Required pcs.	Remarks
1	MIXERS PACKAGE	304-X-302 / 304-X-303	2	
2	SPARE PARTS FOR TWO YEARS OPERATION FOR ALL EQUIPMENT	-	(a)	
3	SPARE PARTS FOR START-UP AND COMMISSIONING FOR ALL EQUIPMENT	-	(a)	
4				
5				
6				

**NOTES:**

(a): Spare parts for start-up, commissioning and 2 years operation by Bidder.



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## Construction of Sulfur Recovery Unit 3

### 2 REFERENCE DOCUMENTATION

Attached to this Request for Quotation are the following documents, listed in Table 2:

TABLE 2

Crt. No.	Document Name	Document Number	Format	Sheets
1	PROCESS DATA SHEET FOR MIXERS PACKAGE	1267PJ-UE117-304-X-302_304-X-303 - MIXERS PACKAGE	A4 / A3	1 / 3 ÷ 2 / 3, 3 / 3

#### 2.1 ADDITIONAL TECHNICAL REQUIREMENTS

- Approval of drawings, calculations and all related documents by LUDAN Engineering S.R.L. (as Detail Design contractor), is mandatory prior to start the fabrication.
- Drawings, calculations and all related documents returned to Bidder for revision, shall be resubmitted within 7 working days.
- Correspondence accompanying revised drawings, calculations and all related documents must show purchase order number.
- Bidder should consider that after fabrication of each equipment the following documents listed in Table 3, must be submitted to Buyer.

In column (3) from Table 3, will be specified the maximum number of weeks starting with the purchase order, in which the drawings and documents for fabrication will be prepared.

TABLE 3

Name of drawings / documents	Dwg. / Doc. Required (YES / NO)	No. of Weeks	Approved execution document.		Documentation "As Built"	
			Req. no of		Req. no of	
			CDs or DVDs	Hard Copy	CDs or DVDs	Hard Copy
(1)	(2)	(3)	(4)	(5)	(6)	(7)
General Arrangement (*)	YES	#	1	3	1	5
Mechanical and Structural Calculations	YES	#	1	3	1	5
Parts List & Materials List	YES	#	1	3	1	5
Instruments and safety devices specifications	YES	#	1	3	1	5

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### Construction of Sulfur Recovery Unit 3

All necessary subassembly drawings and details (including welding)	YES	#	1	3	1	5
Welding Book (including WPS; PQR and WPQ)	YES	#	1	3	1	5
Drawings for ladder and platforms	YES	#	1	3	1	5
Drawings for foundation bolts	YES	(***)	1	3	1	5
Drawings / Procedures for Equipment's Transportation	YES	#	1	3	1	5
Packing List	YES	#	1	3	1	5
Nondestructive Examination Plan	YES	#	1	3	1	5
Nondestructive Examination Procedure	YES	#	1	3	1	5
Post Weld Heat Treatment (PWHT) Procedure	YES	#	1	3	1	5
Hydro Test Procedure	YES	#	1	3	1	5
HAZARD Analysis (if required)	YES	#	1	3	1	5
Measurements Sketch	YES	(**)	1	3	1	5
Marking Sketch	YES	(**)	1	3	1	5
Technical Requirements for Execution Materials	YES	#	1	3	1	5
Materials Quality Certificates	YES	#	1	3	1	5
Spare Parts List for Commissioning (stud bolts; nuts; gaskets)	YES	#	1	3	1	5
Spare Parts List for two Years Operation (stud bolts; nuts; gaskets)	YES	#	1	3	1	5
Inspections and Tests Plan	YES	#	1	3	1	5
Inspections and Tests Documents according to Inspection and Tests Plan	YES	(**)	1	3	1	5
Instructions for: Storage, Installation, Operation, Maintenance. Other necessary instructions	YES	#	1	3	1	5
General Description of Equipment	YES	#	1	3	1	5
Lining material and procedure Specification	YES	#	1	3	1	5
Painting and corrosion protection Specification	YES	(**)	1	3	1	5
Insulation Specification	YES	(****)	1	3	1	5

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### Construction of Sulfur Recovery Unit 3

Fireproofing Specification (if applicable)	YES	#	1	3	1	5
Manufacturing Data Book	YES	(**)	1	3	1	5
Other Drawings / Documents considered necessary (by Bidder)	YES	(****)	1	3	1	5
Sub Vendors List (if any)	YES	#	1	3	1	5
Technical specification and instructions for transport and long-term storage of internally lined equipment.	YES	#	1	3	1	5

#### NOTES:

# According to those provided in the contract.

(\*) General Arrangement drawing shall include **mandatory** as a minimum the following information: dimensions for pressure parts; all overall dimensions; connections nozzles; dimensions for pipes, instruments and direct connecting equipment; dimensions and orientation for the position of nozzles on the equipment; allowable loads on nozzles; table with equipment's technical characteristics; nozzles table; table for materials of construction; table of related project drawings; connection dimensions for foundation; moments and forces due to the earthquake and wind; General Notes.

(\*\*) After fabrication of equipment.

(\*\*\*) Will be manufactured and delivered on site before the execution of support foundation for equipment.

(\*\*\*\*) Immediately after preparation.

- e. Delivery purpose for each equipment shall include (but is not limited to) those specified in **Table 6**

#### NOTES:

- **Bidder** will be fully responsible for the final mechanical and structural design and calculation of the equipment (including the guarantee), according to the requirements from documents indicated in Table 2;
- The indicated thicknesses for pressure parts from Mechanical Data Sheets are minimum required;
- Offer shall include a Spare Parts List for Commissioning;
- Offer shall include a Spare Parts List for 2 years Operating, after guarantee period (quoted separately).

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## Construction of Sulfur Recovery Unit 3

### 3 PRESENTATION LANGUAGE AND MEASUREMENT UNITS

Documents shall be written in the English language.

All dimensions and quantities shall be expressed in S.I. Units.

### 4 CHANGES TO THE REQUEST FOR QUOTATION

In case of changes, major clarifications, and interpretations, **LUDAN Engineering S.R.L.** will revise this **RFQ** and will transmit it to **Buyer**, for subsequent transmission to all **Bidders**.

### 5 COMMUNICATIONS CONCERNING THE REQUEST FOR QUOTATION

**Bidder's** requests for clarifications and interpretations may be obtained by contacting **LUDAN Engineering S.R.L.** or **Buyer**, as follow:

#### 5.1 FOR TECHNICAL AND COMMERCIAL QUESTIONS

For technical questions, the person indicated in Table 4.1 will be contacted.

TABLE 4.1

Ludan Engineering S.R.L.	Surname and Name of Contact Person	Function	Office Phone / Office Cell	E-mail Address
	Petre Vlasceanu	Project Manager	+40 (31) 229.2020 +40 755 100 217	<a href="mailto:petre.vlasceanu@ludan.ro">petre.vlasceanu@ludan.ro</a>

For commercial questions, the person indicated in Table 4.2 will be contacted.

TABLE 4.2

S.C. PETROTEL - LUKOIL S.A. (Buyer).	Surname and Name of Contact Person	Function	Office Phone / Office Cell	E-mail Address
	Ionut Musat	Project Manager	+40 726 815 231	<a href="mailto:IMusat@Petrotel.Lukoil.com">IMusat@Petrotel.Lukoil.com</a>

#### 5.2 WRITTEN REQUESTS FOR INFORMATION

Written requests for information are to be addressed by e-mail to **Buyer**.

### 6 BIDDER'S CONTACT DATA

If the **Bidder** confirmed his participation to the bid, by submitting the Acknowledgement presented on **Appendix No.1.**, it is necessary to fill the fields of **Table 5**, with requested data.

TABLE 5

Quotation no.: .....			Quotation Date: .....	
(Bidder Name)	Surname and Name of contact person	Function	Office Phone / Office Cell	E-mail Address
	.....	.....	.....	.....

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### Construction of Sulfur Recovery Unit 3

#### 7 SCOPE OF SUPPLY

Bidder's scope of works includes but is not limited to those provided in Table 6.

**TABLE 6**

	Bidder to fill with information
<ul style="list-style-type: none"><li>• <b>Detail Design and Calculations</b> Before starting fabrication, the supplier will mandatory submit to <b>Ludan Engineering S.R.L.</b> or to <b>Buyer</b>, the detailed design and calculations, for approval.</li><li>• <b>Detailed Schedule for Design and Calculations</b></li><li>• <b>Functional Specifications</b> Supplier will mandatory submit the Functional Specifications to the client, for approval. Functional Specifications must content also the following:<ul style="list-style-type: none"><li>▪ Inspections and Checking Lists;</li><li>▪ Documents and Certifications issued by manufacturer;</li><li>▪ Technical Specification;</li><li>▪ Marking Specification;</li><li>▪ Painting Specification;</li><li>▪ Packing Specification and/or preservation for transport;</li><li>▪ Other specific information.</li></ul></li><li>• <b>Supply of Materials</b></li><li>• <b>Spare Parts</b></li><li>• <b>Fabrication</b></li></ul>	

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### Construction of Sulfur Recovery Unit 3

- Detailed Schedule for Fabrication

- Shop Inspection and Test Plans

- Technical service representatives

- Painting

- Marking

- Packing

- Delivery

Bidder shall state their best delivery time from the date of receipt of purchase order.

## 8 BID PRESENTATION

The bid should be presented in two sections with the following contents:

- Technical Bid (see Table 7);
- Commercial Bid (see Table 8).

TABLE 7

Technical Bid Content	
<ul style="list-style-type: none"><li>• Technical Specifications</li></ul>	<p>Bid shall give a comprehensive description of the proposed items, clearly indicating name, model, etc., and be accompanied by comprehensive technical information in the language required, such as brochures or catalogue pages.</p> <p>If the proposed items do not comply exactly with the technical specifications and descriptions provided in the RFQ, the nearest functional equivalent or closest standard should be offered as an alternative.</p> <p>Any deviation from the requested specifications shall be documented and explained.</p>

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### Construction of Sulfur Recovery Unit 3

• Drawings / Sketches	
• Quality Assurance	
• Marking	CE Marking
• Warranties	
• References	



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## Construction of Sulfur Recovery Unit 3

TABLE 8

Commercial Bid Content	
• Price	<p>As applicable, the price shall include the cost of the goods, materials, equipment and technical services, as well as shipping (packing, handling, insurance, shipment, customs clearance if applicable) costs to the delivery address.</p> <p>Proper breakdown of each cost element shall be provided separately with relevant details.</p> <p>The price for shipment and taxes (if applicable) should be showed separately</p> <p>Make it clear that the quotation is an estimate or fixed price, by saying "estimate" price or "fixed" price.</p>
• Currency	EURO
• Payment Terms	
• Delivery Terms according to INCOTERMS 2000	DDE
• Delivery Place	Ploiesti, Prahova, Romania
• Delivery Date	
• Warranty Period	
• Country of Origin	
• Contract Draft	NA
• Validity	



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## 9 ADDITIONAL COMMERCIAL REQUIREMENTS

- The Bidder will guarantee the equipment for fabrication's defects of materials and for faulty mechanical design, two years after the equipment starts to operate, or 30 months from the date of dispatch;
- The Bidder will repair or replace without any charge during the warranty period any part of the equipment that has faults, hidden faults or has been inadequately manufactured.

Bidder shall provide unit prices, extensions, and a total price for the following items shown by bidder in Table 1:

[illegible]

**Construction of Sulfur Recovery Unit 3****APPENDIX No. 1**

RFQ reference number		Deadline	
Description		Issued by	

Please fill A, B or C below, and return

<b>A. We shall submit our bid</b>	Company Name Contact Name Office Phone Office Cell E-mail	
<b>B. We may submit and will advise</b>	Company Name Contact Name Office Phone Office Cell E-mail	
<b>C. We will not submit a bid for the following Reasons:</b>  <input type="checkbox"/> The current workload does not permit to take an additional work;  <input type="checkbox"/> We do not have the required expertise for the specific project;  <input type="checkbox"/> Insufficient time to prepare a proper submission;  <input type="checkbox"/> Others.	Company Name Contact Name Office Phone Office Cell E-mail	

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We create chemistry

## Safety Data Sheet Morpholine

Revision date : 2015/05/26  
Version: 3.0

Page: 1/12  
(30036734/SDS GEN US/EN)

### 1. Identification

Product identifier used on the label

**Morpholine**

Recommended use of the chemical and restriction on use

\* The "Recommended use" identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:  
BASF CORPORATION  
100 Park Avenue  
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300  
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification

Molecular formula: C(4)H(9)NO  
Chemical family: secondary amines, aliphatic  
Synonyms: Morpholine

### 2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Flam. Liq.	3	Flammable liquids
Acute Tox.	3 (Inhalation - vapour)	Acute toxicity
Acute Tox.	4 (oral)	Acute toxicity
Acute Tox.	3 (dermal)	Acute toxicity
Skin Corr./Irrit.	1A	Skin corrosion/irritation
Eye Dam./Irrit.	1	Serious eye damage/eye irritation
Aquatic Acute	3	Hazardous to the aquatic environment - acute



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# Safety Data Sheet

## Morpholine

Revision date : 2015/05/26  
Version: 3.0

Page: 2/12  
(30036734/SDS GEN US/EN)

### Label elements

Pictogram:



Signal Word:  
Danger

### Hazard Statement:

H226	Flammable liquid and vapour.
H311	Toxic in contact with skin.
H331	Toxic if inhaled.
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H402	Harmful to aquatic life.

### Precautionary Statements (Prevention):

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing vapours.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260	Do not breathe mist or vapour.
P260	Do not breathe dust or mist.
P243	Take precautionary measures against static discharge.
P273	Avoid release to the environment.
P241	Use explosion-proof electrical/ventilating/lighting/equipment.
P264	Wash with plenty of water and soap thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P242	Use only non-sparking tools.
P240	Ground/bond container and receiving equipment.

### Precautionary Statements (Response):

P310	Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P361 + P364	Remove/Take off immediately all contaminated clothing and wash before reuse.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P370 + P378	In case of fire: Use water spray, dry powder, foam or carbon dioxide for extinction.

### Precautionary Statements (Storage):

P403 + P235	Store in a well-ventilated place. Keep cool.
P233	Keep container tightly closed.
P405	Store locked up.

### Precautionary Statements (Disposal):

P501	Dispose of contents/container to hazardous or special waste collection point.
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### Hazards not otherwise classified

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

### Emergency overview

DANGER:  
CORROSIVE.  
FLAMMABLE LIQUID.  
HARMFUL IF SWALLOWED.  
HARMFUL IF ABSORBED THROUGH SKIN.  
HARMFUL IF INHALED.  
Corrosive to the skin, eyes and respiratory system.  
CAUSES SEVERE BURNS.  
RISK OF SERIOUS DAMAGE TO EYES.  
INGESTION MAY CAUSE GASTRIC DISTURBANCES.  
Avoid contact with the skin, eyes and clothing.  
Use with local exhaust ventilation.  
Avoid inhalation of mists/vapours.  
Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.  
Wear NIOSH-certified chemical goggles.  
Wear protective clothing.  
Eye wash fountains and safety showers must be easily accessible.  
Wear chemical resistant protective gloves.  
Wear full face shield if splashing hazard exists.

### 3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

<u>CAS Number</u>	<u>Weight %</u>	<u>Chemical name</u>
110-91-8	>= 99.45 - <= 99.7%	morpholine

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

<u>CAS Number</u>	<u>Weight %</u>	<u>Chemical name</u>
110-91-8	> 99.0%	morpholine
100-74-3	< 0.2%	4-ethylmorpholine
107-15-3	< 0.3%	ethylenediamine
7732-18-5	< 0.2%	Water
109-86-4	< 0.5%	2-methoxyethanol

### 4. First-Aid Measures

#### Description of first aid measures

##### General advice:

Remove contaminated clothing.



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### If inhaled:

Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary. Immediate medical attention required.

### If on skin:

Wash affected areas thoroughly with soap and water. Immediate medical attention required.

### If in eyes:

In case of contact with the eyes, rinse immediately for at least 15 minutes with plenty of water. Immediate medical attention required.

### If swallowed:

Do not induce vomiting. Rinse mouth and then drink plenty of water. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions. Immediate medical attention required.

### Most important symptoms and effects, both acute and delayed

Symptoms: Overexposure may cause: nausea, diarrhea, coughing, headache

### Indication of any immediate medical attention and special treatment needed

---

## 5. Fire-Fighting Measures

### Extinguishing media

Suitable extinguishing media:  
water spray, dry powder, foam, carbon dioxide

### Special hazards arising from the substance or mixture

Hazards during fire-fighting:  
Substance/product is dangerous when exposed to heat or flames. If product is heated above decomposition temperature, toxic vapours will be released.

### Advice for fire-fighters

Protective equipment for fire-fighting:  
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

### Further information:

If exposed to fire, keep containers cool by spraying with water. Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems.

### Impact Sensitivity:

Remarks: Based on the chemical structure there is no shock-sensitivity.

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## 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

Wear appropriate respiratory protection. Use personal protective clothing. Ensure adequate ventilation.

### Environmental precautions

Substance/product is RCRA hazardous due to its properties.



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### Methods and material for containment and cleaning up

Spills should be contained, solidified, and placed in suitable containers for disposal.

## 7. Handling and Storage

### Precautions for safe handling

Keep away from sources of ignition - No smoking. Take precautionary measures against static discharges. Ensure thorough ventilation of stores and work areas.

Protection against fire and explosion:

Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy.

### Conditions for safe storage, including any incompatibilities

Segregate from acids and acid forming substances.

Suitable materials for containers: Carbon steel (Iron), Stainless steel 1.4301 (V2), Stainless steel 1.4541, Stainless steel 1.4401, Stainless steel 1.4571, Low density polyethylene (LDPE), High density polyethylene (HDPE), glass

Further information on storage conditions: Containers should be stored tightly sealed in a dry place. Avoid extreme heat. Keep container tightly closed. Keep away from sources of ignition - No smoking.

Storage stability:

Storage duration: 24 Months

From the data on storage duration in this safety data sheet no agreed statement regarding the warrantee of application properties can be deduced.

## 8. Exposure Controls/Personal Protection

No occupational exposure limits known.

### Advice on system design:

Provide local exhaust ventilation to control vapours/mists.

### Personal protective equipment

#### Respiratory protection:

Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator. Do not exceed the maximum use concentration for the respirator facepiece/cartridge combination. For emergency or non-routine, high exposure situations, use a NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

#### Hand protection:

Chemical resistant protective gloves

#### Eye protection:

Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.



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### Body protection:

Body protection must be chosen depending on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust).

Body protection must be chosen depending on activity and possible exposure, e.g. head protection, apron, protective boots, chemical-protection suit.

### General safety and hygiene measures:

Eye wash fountains and safety showers must be easily accessible. Wear protective clothing as necessary to prevent contact. When using, do not eat, drink or smoke. Hands and/or face should be washed before breaks and at the end of the shift. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Take off immediately all contaminated clothing. Wash contaminated clothing before reuse. Store work clothing separately.

## 9. Physical and Chemical Properties

Form:	liquid	
Odour:	amine-like	
Odour threshold:	Not determined since toxic by inhalation.	
Colour:	colourless to yellow	
pH value:	10.1 ( 5 g/l)	
Melting point:	-5 °C	
Boiling point:	128 - 130 °C	
Flash point:	32 °C	(DIN 51755)
Flammability:	Flammable.	
Lower explosion limit:	For liquids not relevant for classification and labelling. The lower explosion point may be 5 - 15 °C below the flash point.	
Upper explosion limit:	For liquids not relevant for classification and labelling.	
Autoignition:	255 °C	(DIN 51794)
Vapour pressure:	10 mbar ( 20 °C)	
Density:	1.00 g/cm3 ( 20 °C)	
Relative density:	1.0007 ( 20 °C)	
Partitioning coefficient n-octanol/water (log Pow):	Literature data. -2.55 ( 25 °C)	
Self-ignition temperature:	not self-igniting	
Thermal decomposition:	390 °C, 500 kJ/kg (DSC (DIN 51007)) Thermal decomposition above the indicated temperature is possible.	
Viscosity, dynamic:	2.23 mPa.s ( 20 °C)	
Particle size:	Literature data. The substance / product is marketed or used in a non solid or granular form.	
% volatiles:	0.00 %	
Solubility in water:	( 20 °C) miscible	



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Solubility (qualitative):	miscible
Molar mass:	solvent(s): organic solvents, 87.12 g/mol
Evaporation rate:	Value can be approximated from Henry's Law Constant or vapor pressure.

### 10. Stability and Reactivity

#### Reactivity

Corrosion to metals:  
No corrosive effect on metal.

Oxidizing properties:  
Based on its structural properties the product is not classified as oxidizing.

Formation of flammable gases:	Remarks:	Forms no flammable gases in the presence of water.
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#### Chemical stability

##### Possibility of hazardous reactions

The product is chemically stable.  
Reacts with oxidizing agents.

##### Conditions to avoid

Avoid all sources of ignition: heat, sparks, open flame.

##### Incompatible materials

oxidizing agents, mineral acids

##### Hazardous decomposition products

Thermal decomposition:  
390 °C (DSC (DIN 51007))  
Thermal decomposition above the indicated temperature is possible.

### 11. Toxicological information

#### Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

#### Acute Toxicity/Effects

##### Acute toxicity

Assessment of acute toxicity: Of moderate toxicity after short-term inhalation. Of moderate toxicity after single ingestion. Of pronounced toxicity after short-term skin contact.

##### Oral

Type of value: LD50  
Species: rat  
Value: approx. 1,910 mg/kg (BASF-Test)



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### Inhalation

Type of value: LC50  
Species: rat  
Value: 8 mg/l conservative approach

### Dermal

Type of value: LD50  
Species: rabbit  
Value: approx. 500 mg/kg  
Literature data.

### Assessment other acute effects

Assessment of STOT single:

Based on the available information there is no specific target organ toxicity to be expected after a single exposure.

### Irritation / corrosion

Assessment of irritating effects: Highly corrosive! Damages skin and eyes.  
Irritating to eyes and skin.

### Skin

Result: strongly corrosive  
Method: OECD Guideline 404

### Eye

Species: rabbit  
Result: Risk of serious damage to eyes.  
Method: BASF-Test

Species: rabbit  
Result: Risk of serious damage to eyes.  
Method: OECD Guideline 405

### Sensitization

Assessment of sensitization: Study scientifically not justified.

### Aspiration Hazard

No aspiration hazard expected.

## Chronic Toxicity/Effects

### Repeated dose toxicity

Assessment of repeated dose toxicity: The substance may cause damage to the lung after repeated inhalation. May affect the liver and kidneys as indicated in animal studies.  
After repeated exposure the prominent effect is local irritation.

### Genetic toxicity

Assessment of mutagenicity: In the majority of tests performed (bacteria/microorganisms/cell cultures) a mutagenic effect was not found. A mutagenic effect was also not observed in in-vivo assays.

### Carcinogenicity

Assessment of carcinogenicity: Results from a number of long-term carcinogenicity studies and short-term tests are available. Taking into account all of the information, there is no indication that the substance itself is carcinogenic. IARC Group 3 (not classifiable as to human carcinogenicity).



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Under certain conditions the substance can form nitrosamines. Nitrosamines are carcinogenic in animal studies.  
In long-term studies in rats and mice in which the substance was given by inhalation, a carcinogenic effect was not observed.

### Reproductive toxicity

Assessment of reproduction toxicity: Study does not need to be conducted.

### Teratogenicity

Assessment of teratogenicity: No indications of a developmental toxic / teratogenic effect were seen in animal studies. The product has not been fully tested. The statements have been derived in parts from products of a similar structure or composition.

### **Symptoms of Exposure**

Overexposure may cause: nausea, diarrhea, coughing, headache

### Medical conditions aggravated by overexposure

Data available do not indicate that there are medical conditions that are generally recognized as being aggravated by exposure to this substance/product. See MSDS section 11 - Toxicological information.

## 12. Ecological Information

### **Toxicity**

#### Aquatic toxicity

Assessment of aquatic toxicity:

Acutely harmful for aquatic organisms. The inhibition of the degradation activity of activated sludge is not anticipated when introduced to biological treatment plants in appropriate low concentrations.

#### Toxicity to fish

LC50 (96 h) 180 mg/l, *Salmo gairdneri*, syn. *O. mykiss* (Fish test acute, static)

The details of the toxic effect relate to the nominal concentration. The study was carried out in soft water. Literature data.

LC50 (96 h) 380 mg/l, *Salmo gairdneri*, syn. *O. mykiss* (Fish test acute, static)

The details of the toxic effect relate to the nominal concentration. The study was carried out in hard water. Literature data.

#### Aquatic invertebrates

EC50 (48 h) 45 mg/l, *Daphnia magna* (OECD Guideline 202, part 1, static)

Literature data.

#### Aquatic plants

EC50 (96 h) 28 mg/l, *Pseudokirchneriella subcapitata* (Growth Inhibition Test)

The statement of the toxic effect relates to the analytically determined concentration. Literature data.

EC0 (96 h) 10 mg/l, *Pseudokirchneriella subcapitata* (Growth Inhibition Test)

The statement of the toxic effect relates to the analytically determined concentration. Literature data.

#### Chronic toxicity to fish

Study scientifically not justified.

#### Chronic toxicity to aquatic invertebrates

No observed effect concentration (21 d) 5 mg/l, *Daphnia magna* (OECD Guideline 211, semistatic)



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### Assessment of terrestrial toxicity

No toxic effects have been observed in studies with terrestrial plants.

### **Microorganisms/Effect on activated sludge**

#### Toxicity to microorganisms

OECD Guideline 209 activated sludge, domestic/EC20 (30 min): > 1,000 mg/l  
The details of the toxic effect relate to the nominal concentration. Literature data.

OECD Guideline 209 activated sludge, industrial/EC20 (0.5 h): > 1,000 mg/l  
The details of the toxic effect relate to the nominal concentration.

DIN EN ISO 8192 activated sludge, industrial/EC20 (30 h): < 1,000 mg/l

### **Persistence and degradability**

#### Assessment biodegradation and elimination (H2O)

Readily biodegradable (according to OECD criteria).

#### Elimination information

90 - 100 % DOC reduction (25 d) (OECD 301E/92/69/EEC, C.4-B) (aerobic, municipal sewage treatment plant effluent)

#### Assessment of stability in water

According to structural properties, hydrolysis is not expected/probable.

### **Bioaccumulative potential**

#### Assessment bioaccumulation potential

Accumulation in organisms is not to be expected.

#### Bioaccumulation potential

Bioconcentration factor: < 2.8 (42 d), *Cyprinus carpio* (OECD Guideline 305 C)

### **Mobility in soil**

#### Assessment transport between environmental compartments

The substance will not evaporate into the atmosphere from the water surface.

Adsorption to solid soil phase is not expected.

The data refers to the undissociated form of the substance.

### **Additional information**

The product contains:

The heavy-metal content in the product is below the limit values laid down in normative EN 71 Part III.

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## 13. Disposal considerations

### **Waste disposal of substance:**

Dispose of in a RCRA-licensed facility. Do not discharge into waterways or sewer systems without proper authorization. Dispose of in accordance with national, state and local regulations.



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### Container disposal:

Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers. If containers are not empty, they must be disposed of in a RCRA-licensed facility.

RCRA: D001

## 14. Transport Information

### Land transport

USDOT

Hazard class: 8  
Packing group: I  
ID number: UN 2054  
Hazard label: 8, 3  
Proper shipping name: MORPHOLINE

### Sea transport

IMDG

Hazard class: 8  
Packing group: I  
ID number: UN 2054  
Hazard label: 8, 3  
Marine pollutant: NO  
Proper shipping name: MORPHOLINE

### Air transport

IATA/ICAO

Hazard class: 8  
Packing group: I  
ID number: UN 2054  
Hazard label: 8, 3  
Proper shipping name: MORPHOLINE

## 15. Regulatory Information

### Federal Regulations

#### Registration status:

Chemical TSCA, US released / listed

EPCRA 311/312 (Hazard categories):

Acute; Chronic; Fire

### CERCLA RQ

5000 LBS

100 LBS

### CAS Number

107-15-3

100-74-3; 110-91-8

### Chemical name

ethylenediamine

4-ethylmorpholine; morpholine

### State regulations

#### State RTK

PA

#### CAS Number

109-86-4

#### Chemical name

2-methoxyethanol



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MA	109-86-4	2-methoxyethanol
NJ	110-91-8	morpholine

### CA Prop. 65:

WARNING: THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

### NFPA Hazard codes:

Health : 3      Fire: 3      Reactivity: 0      Special:

### HMIS III rating

Health: 3a      Flammability: 3      Physical hazard: 0

### Assessment of the hazard classes according to UN GHS criteria (most recent version):

Aquatic Acute	3	Hazardous to the aquatic environment - acute
Flam. Liq.	3	Flammable liquids
Acute Tox.	3 (dermal)	Acute toxicity
Acute Tox.	4 (oral)	Acute toxicity
Acute Tox.	3 (Inhalation - vapour)	Acute toxicity
Skin Corr./Irrit.	1A	Skin corrosion/irritation
Eye Dam./Irrit.	1	Serious eye damage/eye irritation

## 16. Other Information

### SDS Prepared by:

BASF NA Product Regulations

SDS Prepared on: 2015/05/26

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