



**R1490101**

## **Tata Steel IJmuiden Directive Lubrication**

### **Oil and Grease Lubrication systems**

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## 1. Introduction

This directive sets out the minimum requirements for lubrication systems within Tata Steel IJmuiden. It represents the Tata Steel IJmuiden policy on the best practice for the design, fabrication, erection, commissioning, use and maintenance of lubrication systems.

The requirements in this document have the aim to minimise the risk to acceptable levels in the following areas:

- a. Health and Safety
- b. Process safety
- c. Environment
- d. Probability of Failure (Production stoppage);  
Mean Time To Repair (unplanned downtime / production loss)
- e. Quality of the end product

Furthermore, some requirements are best practices that have a strong positive impact on the reliability or total cost of ownership of production equipment.

### 1.1. Scope & Application

This directive defines the principles and practices to be applied in the design, fabrication, erection, commissioning, use and maintenance of any lubrication system and is guideline across all sites operated by Tata Steel IJmuiden.

This directive is applicable to new machinery and modifications to existing machinery.

The aim of this document is to provide policy:

- for those parties undertaking conceptual detailed design and manufacturing of lubrication systems;
- on the obligations of the vendor designing and/or supplying equipment;
- on the obligations of personnel that commission, operate or maintain lubrication systems.

## 1.2. Legal & Mandatory compliance

In the case of lubrication requirements which complement or contradict each other, the most stringent requirements shall prevail at all times, according to this order of priority:

1. European, National and regional legislation
2. Tata Steel Europe Code of practice
3. Tata Steel IJmuiden standards
4. Tata Steel IJmuiden directives

The user of this directive must ensure that he is using the most recent version of the directive. The most recent version can be retrieved via the Tata Steel IJmuiden safety website under Regulations: <http://veiligheid.tatasteel.nl/>

The information in this directive has been compiled with great care. Despite this, it is possible that the information published here is incomplete or incorrect or contains errors. Although Tata Steel does its best to provide all information as good and error-free as possible, it cannot be held responsible for any errors, damage or other consequences resulting from the use of this directive. Therefore, no rights can be derived from the information.

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## 2. Requirements

The design of Tata Steel oil and grease lubrication systems is based upon many years of on-site experience. Tata Steel standard oil and grease lubrication systems and components increase safety level, limits the number of spare parts, improves reliability and simplifies maintenance. All new and modified oil lubrication systems will be checked for approval by the Tata Steel Lubrication Advice Department (LAD of Tata Steel; see Appendix 1 for abbreviations).

### 2.1. Safety

#### Requirements

Ensure that the lubrication system complies fully with the relevant European Standards and Directives.

A CE declaration of Conformity shall be supplied for the complete system.

During the design phase of the lubrication system focus on the safety of personnel and equipment during transport, erection, commissioning, start-up / shutdown, operation, inspection and maintenance work.

Ensure that all movements of the system and its components which can cause personal injuries during operation, inspection, start-up / shutdown or maintenance activities, are safeguarded by adequate means.

According to the Directive of Machinery 2006/42/EC a risk assessment shall be performed of the lubrication system and reduce the risks associated with transport, erection, commissioning, start-up / shut-down, operation, inspection and maintenance work.

This risk assessment shall not only be related to the lubrication system itself, but also onto the lubrication system as it is operating in its surroundings.

## 2.2. Documents

### Requirements

All drawings supplied by contractor shall comply with following Technical Directives:

- a. R1 05 80 01: Drawing regulations for Tata Steel
- b. R1 05 80 02: Tata Steel CAD drawing rules
- c. R1 05 80 03: Tata Steel E-PLAN regulations
- d. R1 05 80 04: Tata Steel Inventor (3D) drawing rules
- e. R1 05 80 05: Tata Steel E3D model criteria

## 2.3. General Requirements

### Requirements

Lubrication systems and their components shall be easily accessible for maintenance purposes without scaffolding.

Lubrication systems required are complete integrated systems with pump unit(s), filters, interconnecting piping, sensors etc. up to the lubricated component.

A lubrication table is required which identifies all lubrication points; lubricant consumption (oil xx l/min) or dosage and interval (grease xx cm<sup>3</sup>/hour).

Fire safety shall be regarded in the design of lubrication systems and is subjected to review by the fire safety department of Tata Steel based on a risk assessment according to Tata Steel Engineering Code Of Practice 'Fire prevention and protection equipment' (EC-10.2). If applicable, specific fire safety requirements will be defined during the basic engineering phase.

Sub-suppliers available for testing and commissioning need to demonstrate their working methods which need approval of the LAD of Tata Steel.

Choice of components and third-party materials needs to be approved by the LAD of Tata Steel. An accepted vendor list for lubrication components and materials is used by Tata Steel and available on request.

### 3. Lubrication systems

#### 3.1. General requirements for oil and grease lubrication

##### Requirements

The lubrication system should not affect the line operation.

For items which need frequent lubrication, automatic lubrication should be installed.

Lifetime lubricated components have the preference above manual greasing.

Grease nipples are placed on the operator side, where possible and within reach (outside safety zones) for maintenance during running operation. The nipples have to be based on a manifold, where possible.

Grease locations in dangerous area's which need frequent lubrication shall be connected to automatic lubrication systems, if possible.

Small installation parts (e.g. gearboxes) with a separate oil system shall have a visible level indication.

Gearboxes with splash lubrication shall be provided with visible level indication.

Lubricated installation parts, filling and grease points shall be within normal reach and accessible outside safety zones.

Large and/or important parts with an oil system shall be preferably connected to a central system where Flow, Pressure, Temperature, Level and filtration are monitored with visibility on the HMI and with both optical and electrical signalling.

Use proven technology to guarantee spillage free oil sealing between static and rotating parts (with a long lifetime and easy maintenance).

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### 3.2. Automatic Oil lubrication systems

#### Requirements

In general, automatic oil lubrication systems shall be functional for all ambient conditions and for an ambient temperature range from -10 ° to + 40 °C.

Measures to assure functionality for approval of the LAD of Tata Steel;

- a. The pump station shall be accessible without opening safety zones;

Gearboxes to be provided with:

- b. Spray nozzles in gears operating pressure 1-2 bar(g);
- c. Spray pipes shall always be removable;
- d. Nozzles need to be adjustable regarding the spray location or have a fixed designed spray location;
- e. Inspection hatches are required to inspect gear and nozzles;
- f. Hatches to be accessible safely without scaffolding.

Automatic oil lubrication systems shall be supplied with a conditioning and monitoring system to control the following conditions:

- a. Oil temperature (conditioned temperature);
- b. Oil pressure;
- c. Oil flow;
- d. Moisture content;
- e. Level indication (layer type) with level switches;
- f. Filter clogged indication, electrical and optical.

All signals and settings available at HMI (flow, pressure, temp, level etc.)

Pump programming (start/stop conditions, automatic switch over to spare pump) is part of basic engineering.

Automatic oil lubrication systems shall be minimal containing:

- a. Double filter switchable with filter elements mesh width min. 25 µm or better depending on required ISO 4406-2017 cleanliness class.
- b. Hygroscopic air filter 3 µm;
- c. Sample point(s) consisting of a drain and ballcock; and a Resopal plate marked "monsternamepunt";
- d. If required: electrical heating allowed max. 0.8W/cm<sup>2</sup>;
- e. System pressure safety valve overflow direct to tank;
- f. Butterfly valves for suction and pressure line. Suction butterfly valve to be with visual and electrical position-indication;
- g. Flow control and pressure sensors for each main spray pipe at the gears and bearings to ensure a proper flow, good visible;
- h. Filling filter 10 µm or smaller for tank filling.

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#### Requirements

A plate shall be attached to the oil tank(s) clearly showing the following information:

- a. Oil filling:....litres;
  - b. Oil Type: ....;
- Oil type for approval of the LAD of Tata Steel.

### 3.3. Manual Oil lubrication systems (bath lubrication)

#### Requirements

Gearboxes to be provided with:

- a. An oil level indicator;
- b. Hygroscopic air filter 3  $\mu\text{m}$  ;
- c. Sample point(s) consisting of a drain, ballcock and stop; and a Resopal plate marked "monsternamepunt" preferably screwed on the gearbox;
- d. Oil drain with ballcock and stop.

A plate shall be attached to gearboxes clearly showing the following information:

- a. Oil filling: ....litres;
  - b. Oil Type: ....;
  - c. Transmission: 1: ...
  - d. Year of build: 20..
- Oil type for approval of the LAD of Tata Steel.

### 3.4. Oil-air lubrication systems

#### Requirements

Oil-air lubrication systems shall be designed according to following information:

- a) the required amount of oil per lubrication point per time unit;
- b) the number of lubrication points;
- c) the location of the lubrication points;
- d) ambient temperature;
- e) oil type.

The required amount of oil per lubrication point is determined by the nature of the object to be lubricated. The maximum permissible ambient for using oil-air systems temperature is set at 80 ° C.

Conditioning of oil-air lubrication systems:

- a) Double filter (switchable) 10  $\mu\text{m}$ , electrical/ optical signal.
- b) Dry air is required and can be achieved by using a filter-reducer combination or, if not available, an air-dryer.

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### 3.5. Automatic Grease lubrication systems

#### Requirements

Automatic centralized grease systems must be fed by a separate fill system in case of a high consumption (guideline > 6.000 kg/year).

The pump station must be accessible without opening safety zones. The bulk container and pump to be preferably placed in a temperature controlled closed housing.

The bulk container filling line must be easily accessible for a bulk truck.

Resulting operating system pressure for grease systems should be limited to approximately 150 bar(g), pump pressure max. 350 bar(g) (see also § 5.2 "Guidelines for grease system piping").

The systems shall preferably be dual line end of line type minimal containing:

- a. Container, size based on consumption, with ultrasonic level control and heater;
- b. Pneumatic, electric and manual pump units,
- c. Fill valve at the system grease pump;
- d. Pressure safety valve (if not included in the pump unit);
- e. Change over valve;
- f. Distributors with visual position signalling, easily accessible for maintenance purposes;
- g. Distributors without visual position signalling for harsh environment, easily accessible for maintenance purposes;
- h. All distributors in a harsh environment need to be protected by means of a cabinet or rigid and easy to open cover;
- i. Pressure gauges;
- j. Pressure sensors with digital local readout combined with analogue pressure gauges.

The systems shall be controlled by a central PC/PLC with separate control, testing and programming possible for each lubrication system or in case of a stand-alone lubrication system with its own PLC.

Programming of lubrication systems for approval of the LAD of Tata Steel.

All signals and settings available at HMI (pressure, temperature, level etc.).

### 3.6. Manual Grease lubrication systems

#### Requirements

The number of manual greasing points should be kept to an absolute minimum.

Greased bearings shall be installed in bearing housings with spacious grease chambers and the possibility of additional greasing.

All grease nipples according to DIN 71412 or DIN 3404 to be easily accessible without scaffolding and without opening safety fences or by connecting to distribution blocks outside of the safety fences, depending on piping pressure drop.

Provide drawings which show the location of the grease nipples.

## 4. Lubricants

### Requirements

For detailed information regarding lubricants please refer to Tata Steel Preferred Lubricants list.

Lubricants used to be classified according to ISO standard ISO 6743 and approved by the LAD of Tata Steel.

Lubricants selected for operation shall be the same as used for first fill (f.i. for gears and bearings).

Availability of the following properties of these lubricants is minimal required for approval of the LAD of Tata Steel:

- a. Pumpability at operating conditions (for grease only);
- b. Shelf life of the lubricant in closed and opened condition.;
- c. If applicable the lubricant shall not have a negative effect on the cooling water treatment process.

## 5. Lubrication Piping/ Tubing

### 5.1. Piping material requirements

Requirement
All piping and connectors shall comply with Tata Steel pipe specification.
Piping to be made in general of carbon steel, with specification as stated in Tata Steel pipe specification:
<ul style="list-style-type: none"> <li>- LS016</li> <li>- LSS016</li> <li>- LS350</li> <li>- LSS350</li> </ul>
The use of hoses is permitted but shall be minimized. Application of hoses and alternative piping is subjected to approval of the LAD of Tata Steel.
For oil system fittings use EO2 type clamp fittings.
The piping outer conservation must be according to Protective Coating specification (see Tata Steel Standard S3 10 56 01).
Marking of pipelines shall be according to Tata Steel Standard S1 76 81 01.
Pipe welding must be executed according to Tata Steel Standard S1 45 04 01.
For flushing of the piping, a separate flushing unit is required, a flushing plan is to be provided and sent for approval of the LAD of Tata Steel.
For oil lubrication systems return piping shall be installed with a required slope min. 3%.

## 5.2. Guidelines for grease system piping

### Requirements

System pressure losses should be kept as low as possible by choosing shortest possible piping and sufficient DN sizes taking into account the ambient temperature. Resulting operating system pressure for grease systems should be limited to approximately 150 bar(g), pump pressure max. 350 bar(g) (see also § 3.4 “Automatic grease lubrication systems”).

For grease systems a calculation of accumulated volume in piping (pipe length x diameter) in relation to the required volume is required to show the grease shall not stay longer then the max. lifetime of the grease inside the system.

Piping to be protected or “hidden” so it can’t be used as step up.

Minimize the use of T connections for mainlines.

Avoid pipe size changes and sharp corners as much as possible.

No piping along hot installation parts, if necessary protect the piping for heat or choose other routing.

In case of cold conditions use tracing, if necessary.

Grease selected for operation shall be used for first fill of piping before commissioning.

All installation components including gaskets shall be checked for lubricant compatibility.



## 6. References

This Tata Steel directive refers to:

### Internal:

EC-10.2

2006/42/EC

R1 05 80 01

R1 05 80 02

R1 05 80 03

R1 05 80 04

R1 05 80 05

S3 10 56 01

S1 76 81 01

S1 45 04 01

LS16 - LS350

LSS16 - LSS350

Engineering Code of Practice Fire prevention  
and protection equipment

Directive of Machinery

Drawing regulations for Tata Steel

Tata Steel CAD drawing rules

Tata Steel E-PLAN regulations

Tata Steel Inventor (3D) drawing rules

Tata Steel E3D model criteria

Corrosion control by use of protective coatings

Marking of pipelines

Execution and inspection of welding work

Pipe class Carbon steel

Pipe class Stainless steel

Tata Steel Preferred Lubricants list

### External:

NEN-ISO 6743

ISO 4406-2017

DIN 71412: 1987-11

DIN 3404: 1988-01

Lubricants, industrial oils and related products (class L)

Hydraulic fluid power – Fluids – Method for coding the  
level of contamination by solid particles.

Lubricating nipples: cone type

Lubricating nipples: button head

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## Appendix 1 - Abbreviations

CE	Conformité Européene (European Conformity)
DIN	Deutsches Institut für Normung
EC	Engineering Committee
ISO	International Organization for Standardization
LAD	Lubrication Advice Department
NEN	Nederlands Norm

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