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Guidance on Industry Standard for Oil Mist Lubrication Systems

GIS 34-702

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GIS 34-702. This Guidance on Industry Standard (GIS) is based on parts of the heritage document from the merged BP companies as follows:

Amoco

A RE-LUBE-MST-P Rotating Equipment—Lubrication—Oil Mist Systems—Procurement Specification.

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1. Scope

This GIS provides guidance on industry standard for design of and materials for oil mist lubrication systems.

The oil mist system (a dispersion of oil droplets 1 to 3 micron size in an air system) may be used for providing lubrication to anti-friction bearings and/or for bearing housing, gearbox, or other machinery purging. This GIS includes the piping system requirements, machinery bearing system modifications, and procedures for commissioning such a system.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

BP

GIS 06-XXX Guidance on Industry Standard for Coatings (A CP-COAT-ATM-C).

International Electrotechnical Commission (IEC)

IEC 60079-10 Electrical apparatus for explosive gas atmospheres
Part 10: Classification of hazardous areas (IEC).

National Fire Protection Association (NFPA)

NFPA 70 National Electrical Code (NEC).

3. Terms and definitions

For the purposes of this GIS, the following terms and definitions apply:

Distribution system (header)

Piping/tubing network through which mist is transported from console to bearing housings where it is used.

Drain System

Means for collecting oil that coalesces in bearing housing. Drain system includes bottle under bearing housing, drain tubing, and oil collection container for holding coalesced oil.

Conservation systems are now available to collect 90% + of the oil from the drain system for reclamation.

Header pressure (mist pressure)

Pressure of oil mist inside header. Normal design pressure is 5 kPa (20 in of water (0,7 psig)).

Oil mist generator (OMG)

Preengineered machinery package that includes equipment and instrumentation designed to produce oil mist. Basic OMG components are local oil reservoir that receives its supply from oil bulk storage



tank, mist generating head, local air filter/pressure controls for establishing mist volume and pressure, and local instrumentation package to monitor specific operating variables.

Pure Mist (dry sump)

Arrangement in which no oil level is maintained in bearing housing. Lubrication occurs by coalescence of oil mist on rolling elements within bearing housing.

In pure mist applications, standard rolling element bearings housings should be evaluated for the particular application. The evaluation should include the analysis of the oil mist flow through the bearing housing. Any bearing housing designed originally for oil rings, may have areas where the mist can flow passing the bearings. These flow areas may need to be plugged or restricted in some way to assure the mist flow is through the bearing(s).

Purge Mist (wet sump)

Arrangement in which oil mist purges bearing housing to exclude moisture and contamination from external environment. Normal bearing housing oil levels are maintained and applied with conventional oil bath, flinger, or oil rings.

Reclassifiers

Special fittings or restrictions mounted in supply manifold that meter oil mist to individual equipment lubrication points. Reclassifiers are long path orifices that cause small particle size “dry” mist in header to convert to larger particle size “wet” mist that can lubricate bearings.

Regulated Air Pressure

Air pressure required by generator to maintain header pressure at 5 kPa (20 in of water).

Supply Manifold

Multiported terminal blocks installed at end of equipment drop piping. Manifold blocks divert oil mist to individual equipment lubrication points.

4. General

- a. Determination of suitability of oil mist users shall be provided.

Application of oil mist lubrication allows rolling element bearing lubrication with minimum operator activity.

- b. System sizing and design shall be provided.
- c. OMG selected and recommended shall be subject to BP approval.

5. System sizing

5.1. Pure mist applications

Pure mist applications require positive flow across the bearings.

- a. Recommendations for application of directed mist shall be provided. Use of directed mist shall be subject to BP approval.

Directed mist applications call for fitting that directs the mists toward a particular bearing. These are most typically installed for the active thrust bearing, or possibly for both the active and inactive thrust bearing for a double suction single stage pump.



- b. Volume requirements for pure mist shall account for shaft size and number of rows of elements in each bearing housing.
- c. Minimum air flow (standard m³/h (SCFM)) input for pure mist antifriction shall be determined by the following equation:

$$\text{Standard m}^3/\text{h (SCFM)} = \text{CI} \times \text{D} \times \text{N}$$

Where:

CI = Service Factor
D = Shaft Diameter in mm (in)
N = Number of rows of balls or rollers

- d. Service factor CI shall be as follows:
 1. $1,47 \times 10^{-3}$ (0,022) service factor shall be used if equipment speed is 3 800 rpm or less and equipment power is less than 150 kWh (200 hp).
 2. $3,01 \times 10^{-3}$ (0,045) service factor shall be used if equipment speed is more than 3 800 rpm or if equipment power is 150 kWh (200 hp) or more.
 3. $3,01 \times 10^{-3}$ (0,045) service factor shall be used if product temperature is in excess of 204°C (400°F).
 4. $3,01 \times 10^{-3}$ (0,045) service factor shall be used for directed mist applications.

5.2. Purge mist applications

In purge mist applications there is no need to establish positive flow across the bearings.

Mist flow for purge applications shall be as follows:

- a. For bearing housings with internal volumes less than 0,1 m³ (4 ft³)
0,15 Standard m³/h (0,09 SCFM).
- b. For bearing housings with internal volumes 0,1 to 0,2 m³ (4 to 8 ft³)
0,30 Standard m³/h (0,18 SCFM).
- c. For bearing housings with internal volumes greater than 0,2 m³ (8 ft³)
0,50 Standard m³/h (0,30 SCFM).

5.3. Capacity

- a. OMG head(s) shall provide 125% of required airflow.
- b. Number of OMGs shall be minimised.
- c. OMG head(s) shall be sized such that minimum required regulated air pressure exceeds 70 kPa g (10 psig).

6. Console

6.1. Standard features

OMG types as defined in Figures 1, 2, and 3 shall include:

- a. Unrestricted oil suction tubes with no variable orifices restricting oil flow.
- b. Air bypass control increasing mist manifold pressure and airflow without increasing oil output.
- c. Oil flow regulating valve controlling mist density without restricting oil output.

