

EXXON EXXON ENGINEERING	COMPRESSORS COMPRESSOR UNIT AUXILIARY AND INSTALLATION FACILITIES PROPRIETARY INFORMATION - For Authorized Company Use Only	DESIGN PRACTICES	
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Revision Memo

12/98 Figures 1, 2, 3, and 4 modified to include Metric units.



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SCOPE

This section applies to the basic requirements for auxiliary systems, instrumentation, and the installation facilities for erection and maintenance of compressor units. Facilities that are unique to one type of compressor or driver only are covered in the section devoted to that type of machine.

REFERENCES

DESIGN PRACTICES (BESIDES OTHER SUBSECTIONS OF SECTION XI)

- [Section XVIII](#) Air Pollution Control, Industrial Hygiene, and Noise Control
[Section XXIX](#) Civil Works

INTERNATIONAL PRACTICES

- [IP 3-3-6](#), Closed Cooling Water Systems for Internal Combustion Engines and Reciprocating Compressors
[IP 3-9-1](#), Winterizing and Protection Against Ambient Temperature
[IP 4-6-2](#), Supporting Structures and Foundations for Heavy Machinery
[IP 10-11-1](#), Sizing of Drivers and Transmissions for Compressors, Fans, and Pumps
[IP 10-12-1](#), Vibration, Axial-Position, and Bearing-Temperature Monitoring Systems for Compressors and Drivers
[IP 10-14-1](#), Lube and Seal Oil Systems for Machinery
[IP 15-1-2](#), Instrumentation for Compressors and Drivers
[IP 15-7-2](#), Protective Systems

OTHER LITERATURES

- API Standard 614, *Lube and Seal Oil Systems for Special Purpose Applications*.
- O'Conner and Boyd, *Chapter on Circulating Oil System Design*, Standard Handbook of Lubrication Engineering.
- Zierau, S., EE Memo No. EE.12ERL.71, *Combined Versus Separate Lube and Seal Oil Systems for Centrifugal Compressors in Sour Gas Service*, April 9, 1971.
- Exxon USA, Lube text DG8A, Compressor Lubrication.

BACKGROUND

Design of the auxiliary facilities necessary for installation and operation of a compressor is just as critical for the success of a compression service as is the selection of compressor type and model. However, specification of the various installation facilities does not require as much design phase effort, because most of the engineering detail is covered by International Practices and is developed during the detailed engineering phase. In most cases, the design phase task is simply to decide which installation facilities are to be provided, and which type they should be.

COMPRESSOR CONTROL

ALARMS AND SHUTDOWN FACILITIES

Alarms are specified when the operator's attention should be called to a deviation from normal conditions so that he can take remedial action or monitor the condition closely. Shutdown features are provided when the condition can easily lead to major equipment damage before an operator can take remedial action.

Shutdowns should include alarms to indicate the fact and cause of the shutdown. These are termed "Shutdown" alarms. Every shutdown feature should be accompanied by an independent alarm sensing the same parameter, but set to precede the shutdown, to give the operator a chance to take remedial action. These are termed "prealarms."

Compressor alarm and shutdown facilities may be generally grouped into the categories described in the following subheadings:

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COMPRESSOR CONTROL (Cont)

Those provided with the compressor equipment by the machine vendor, for mechanical protection of the machine and the auxiliary systems:

1. Low lube and seal oil pressure prealarms and tripouts.
2. Low oil reservoir level alarm.
3. High bearing temperature alarm.
4. High vibration prealarm and danger tripout.
5. Rotor axial movement prealarm and danger tripout.
6. High winding temperature alarm for motors.
7. Driver overspeed tripout for turbines.
8. Piston rod excessive drop alarm for reciprocating compressors where excessive wear of piston rings will cause dangerous misalignment of the piston rod.

Those provided to protect the compressor from harm by process system variations or malfunctions:

1. High inlet separator drum liquid level prealarms and trips.
2. High discharge gas temperature alarms.
3. Low suction or interstage pressure (or high cylinder differential pressure) alarms for reciprocating compressors where piston rods are critically loaded.
4. Low flow alarms signaling the functioning of an anti-surge recycle system for axial and centrifugal compressors.

Those provided to protect the process or other equipment from abnormal machine operation:

1. Low inlet pressure alarm when a gas compressor is capable of reducing the inlet pressure to a vacuum level, thus encouraging ingress of ambient air at inlet system flanges and shaft stuffing boxes.
2. High exhaust temperature alarm from a back pressure steam turbine to warn of exhaust temperature above the piping system design rating, due to operation at a low efficiency load level (e.g., slow roll for warmup).
3. High compressor discharge temperature on services which require continuous, effective compressor cooling for proper process operation, such as vacuum pump services and certain liquid ring compressor and dry rotary screw compressor services.

PERMISSIVE START FEATURES

Closely related to automatic shutdown features are "permissive start" features which will not allow the driver to be started until certain favorable conditions are established. Permissive starts are specified by International Practices for lube and seal oil pressures and suction drum level. They are seldom applied to process conditions, but can be specified when careless startup could easily damage the compressor or other system equipment. Examples are high or low suction pressure that could overload the driver, low suction temperature that could induce liquid ingestion. The switches that perform "shutdown" normally also function as permissive start features.

SPECIFICATION

The minimum requirements for mechanical alarms, shutdown, and permissive start features are specified in the International Practices for each machine type. A convenient tabulation is given in [IP 15-1-2](#). Machinery vendors frequently require additional safety features to suit their particular warranty policies and equipment designs.

Process alarm, shutdown, and permissive start features may be indicated on Design Specification process flow sheets or specified in the compression service design text.

INSTRUMENTATION FOR MINIMUM MANNING

Instrumentation Additions provide a practical way of increasing the safety and operability of compressor units in minimum manning situations, in return for incremental investment. The following examples are worthy of individual consideration in each individual case:

Reciprocating compressors can be provided with special instrumentation harnesses to reduce their monitoring requirements to close to those of centrifugal compressors. These include piston rod packing temperature alarms, individual cylinder high discharge temperature alarms (for valve failure), crankcase vibration alarms, force feed lubrication failure alarm, automatic replenishment of crankcase lube oil, high liquid level alarms and shutdown on interstage separators, etc.