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BASIC PROCESS DESIGN REQUIREMENTS AND CRITERIA FOR REFINERIES

(PROJECT STANDARDS AND SPECIFICATIONS)

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SCOPE

This Project Standards and Specifications presented for basic process design requirements and criteria for Refineries. Specific information is included to aid the basic process design requirements and criteria.

INTRODUCTION

The purpose of this document is to define the rules, which have to be followed to prepare a Basic Process Package for a Refinery, or to specify any individual piece of equipment in the absence of specific requirements on the subject from the Client in the Contract.

When such requirements exist, they have to be followed and the present document should be modified accordingly.

In case of licensed units, the rules of the Process Licensor will be followed as much as possible for equipment to be added, in order to have a consistent design.

DESIGN PRESSURE

A. Design pressure at individual equipment

Except for special reasons (for example desalter, storage silos), the following design criteria will be applied defining P_D according to P_{MO} :

P_D : minimum mechanical design pressure
P_{MO} : maximum continuous operating pressure

P_{MO} (barg)	P_D (barg)
< 0	Full vacuum and 2.5 or 3.9 barg
0 - 10	P_{MO} + 1
10 - 35	P_{MO} x 1.1
35 - 70	P_{MO} + 3.5
> 70	P_{MO} X 1.05

Notes

1. Full vacuum design conditions will be applied to equipment that fulfill one of the following conditions :

   - Normally operates under vacuum
   - Is subject to vacuum during start-up, shut-down or regeneration
   - Normally operates full of liquid and can be blocked in and cooled down
   - Can undergo vacuum through the loss of heat input (to be studied case by case. Vacuum prevention systems are also acceptable).

   Partial vacuum design conditions are normally not considered except for the following cases :

   - When the sub atmospheric pressure is determined by the vapor pressure of the vessel contents. Then consider the vapor pressure associated with the minimum ambient temperature.
   - When the thickness of equipment is determined by external pressure calculation instead of internal pressure. flen it has to be considered case by case.

2. With a minimum of 3.9 bar g or 2.5 bar g according to paragraph 2.3 here below.
   Not applicable for thin wall equipment such as vessels open to atmosphere, storage tanks,

storage silos where full of liquid can be the governing case.

3. For equipment in equilibrium with flare the design pressure is the flare design pressure.

B. Design pressure profile for columns and reactors

The same design pressure will be selected for the top of a fractionator column and associated condenser, reflux drum and interconnecting piping.

The design pressure at the bottom of a fractionation column will be determined as follows:

$$P_{DB} = P_{DT} + \Delta P_1$$

Where:

P_{DB} = Design pressure at the bottom (vapor phase)
P_{DT} = Design pressure at the top
ΔP_1 = Column pressure drop

C. Minimum set pressure of safety valves

3.9 bar g for a safety valve discharging to flare(1)
2.5 bar g for a safety valve discharging to atmosphere

Note

(1) For distillation columns. 3.9 bar g is the design pressure at the bottom of the column (vapor phase), the set pressure will be determined accordingly but not lower than 3.5 barg.

D. Design pressure at the discharge of a centrifugal pump

1. *As* a general rule the design pressure will be the maximum of the values calculated by the two following formulas :

$$P_{DD} = P_{SM} + \frac{H_{\max} \times d_{\max}}{10.2}$$

$$P_{DD} = P_{DA} + \frac{H_C \times d_{\max}}{10.2}$$

Where :

P_{DD} : Design pressure at the discharge of the pump (bar g)
P_{DA} : Design pressure at the suction of the pump (bar g)
P_{MO} : Maximum operating pressure at the suction of the pump (bar g)
H_{max} : Maximum differential head of the pump, generally at no flow condition (m)
Hc : Rated differential head (m)
d_{max} : Maximum flowing specific gravity.

2. In fact, at the time of the development of the Basic Process Package, the maximum differential head of the centrifugal pump is not available, as the selection of the pump is not yet done.

$$P_{DD} = P_{DA} + \frac{1.2 \times H_C \times d_{\max}}{10.2}$$

P_{DA} : Safety valve set pressure for the suction vessel (bar g)

+ Pressure drop through the vessel (bar), if any
+ Maximum static head at pump suction $m \times \frac{d_{\max}}{10.2}$

At the detail engineering stage, it will be checked, after pump selection, that the design pressure calculated by the formula is in accordance with the criteria of paragraph 1.