

## DEP SPECIFICATION

# VIBRATING FLUID BED DRIER/COOLER SYSTEMS

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## DESIGN AND ENGINEERING PRACTICE



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## 1. INTRODUCTION

### 1.1 SCOPE

This new DEP specifies requirements and gives recommendations for the design of vibrating fluid bed type of bulk solids drier and/or cooler systems, and for the selection of system components. It covers the requirements for the supply, mechanical design, fabrication, shop assembly, shop painting and delivery of vibrated fluid bed type of bulk solids drier and/or cooler systems.

### 1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

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This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

### 1.3 DEFINITIONS

#### 1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

**1.3.2 Specific definitions**

| <b>Term</b>                  | <b>Definition</b>                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Capacity</b>    | The average capacity to be expected under normal operating conditions, including down-time periods for regular maintenance and repair.                                                                                                                                                                                                                                           |
| <b>Peak Capacity</b>         | The maximum capacity ever to be expected, for any period of time as required by the operation.                                                                                                                                                                                                                                                                                   |
| <b>Design Capacity</b>       | The capacity on which basis the structural and mechanical design calculations are made. The design capacity shall be 115 % of the peak capacity.                                                                                                                                                                                                                                 |
| <b>Dryness Specification</b> | The average value of the moisture content of the “dried” product, expressed as a weight percent, dry basis. The dryness specification includes the maximum allowable fraction of product with a moisture content exceeding an upper limit (e.g., an average moisture content not exceeding 2 %, with not more than 1 % of the product having moisture content greater than 5 %). |
| <b>Freeboard</b>             | The distance allowed above the surface of the fluid bed in the drier enclosure for the fall-back of particles ejected from the surface of the fluid bed caused by the bursting of gas bubbles.                                                                                                                                                                                   |
| <b>Gas Mass Flux</b>         | The mass flow rate of the drying gas per unit area ( $\text{kg/m}^2\text{sec}$ ). Its value is the product of the gas density ( $\text{kg/m}^3$ ) and the average gas velocity ( $\text{m/sec}$ ) at the distribution deck.                                                                                                                                                      |
| <b>Average Gas Velocity</b>  | The average gas velocity ( $\text{m/sec}$ ) is the total volumetric gas flow rate ( $\text{m}^3/\text{sec}$ ) at the temperature and pressure just above the distribution deck divided by the total usable area of the distribution deck ( $\text{m}^2$ ).                                                                                                                       |
| <b>Gas Mass Flow Rate</b>    | The gas mass flow rate ( $\text{kg/sec}$ ) is the product of gas mass flux ( $\text{kg/m}^2\text{sec}$ ) and the area of the distributor ( $\text{m}^2$ ) (i.e., the product of the gas density ( $\text{kg/m}^3$ ) and the volumetric gas flow rate ( $\text{m}^3/\text{sec}$ ) at the temperature and pressure conditions just above the distributor deck).                    |
| <b>One-Mass Units</b>        | A vibrating fluid bed unit where the driver vibrates the fluidized bed and its enclosure while the support base remains motionless. Coil or leaf springs and pivot links restrain the motion of the vibrating bed. The dynamic reaction forces are transmitted through the springs to the support base.                                                                          |
| <b>Two-Mass Units</b>        | A vibrating fluid bed unit where the fluidized bed is supported by a base frame which also vibrates and which is mounted on isolation springs. The dynamic forces are partially isolated from the external support. Variations can utilize isolation and counterbalancing to minimize the transmitted dynamic reactions.                                                         |
| <b>Shim</b>                  | A thin and often tapered or wedged piece of material, used to fill small gaps or spaces between objects. Shims are typically used in order to support, adjust for better fit, or provide a level surface. Shims may also be used as spacers to fill gaps between parts subject to wear.                                                                                          |

**1.3.3 Abbreviations**

| <b>Term</b> | <b>Definition</b>                      |
|-------------|----------------------------------------|
| <b>ANSI</b> | American National Standards Institute  |
| <b>ASTM</b> | American Society for Testing Materials |
| <b>AWS</b>  | American Welding Society               |