
# FIXED BED LOADING PROCEDURE

V:1 2022

Industrial Performance Services

Industrial Tubular Catalyst Services

# Fixed Bed Loading Procedure

January 2022

## INSTRUCTION DESCRIPTION:

The following instructions have been prepared by the HSEQT Manager to serve as a reference for users of various catalysts. They are submitted to assist the user in obtaining optimum performance and are written in a general tone so as to be compatible with the individual procedure preferred by a specific company.

## SAFETY

All personnel involved in the use of the catalyst must thoroughly review the catalyst safety documentation and loading procedures prior to proceeding with catalyst installation. Proper handling and special protection information as described in the Material Safety Data Sheet or Safety Data Sheet must be followed at all times. In addition, these personnel must comply with current applicable occupational health and safety standards.

## CATALYST STORAGE AND HANDLING

Catalysts are generally shipped in sealed plastic lined metal drums, big bags (super sacks) or Flo-Bins Indoor storage is preferred. Catalysts should be stored in a clean and dry environment whenever possible. Freezing temperatures will not adversely affect the catalyst, provided it is kept free of moisture. Under normal conditions, the catalysts can be stored for years with no degradation of its performance or physical characteristics. If it is necessary to temporarily store the catalyst outdoors, it should be stacked on pallets at an elevated location to prevent contact with standing water and carefully covered to prevent wetting by precipitation. If the catalyst has been exposed to moisture or stored for long periods, a dry-out procedure is required prior to start-up. Rolling of the drums should be strictly avoided if at all possible.

## PRE-LOADING REQUIREMENTS

Prior to catalyst loading, the following items must be checked:

1. Confirm that loading personnel do not have any items on their person that could potentially be accidentally left in the reactor (e.g. tools, gum, lighters etc.).

2. Thoroughly inspect the empty vessel to make sure that it is free of debris which could cause plugging or flow mal-distribution. Inspect all reactor internals, man-ways, manway covers, bolts, nuts etc. and repair or replace parts if necessary.

3. Inspect all vessel connections such as inlet and exit lines and thermowells to insure that they are in good condition.

4. Inspect any screens that are to be installed (old and new) to ensure that they are clear and damage free.

5. Inspect all grid supports and screen fasteners to ensure that catalyst particles or bed support material cannot pass around or through the support screen.

6. Ensure that all flanges or dump nozzles have been re-installed and tightened.

7. Inspect all catalyst and support balls when received. Although most catalysts have been screened prior to shipment and normally can be loaded directly into the reactor without further screening, rough handling during shipment could necessitate a light screening prior to loading. Therefore, be prepared by having equipment and facilities available to execute a catalyst screening if required.

**Important:** If it is necessary for personnel to enter the vessel during loading, the following additional precautions need to be taken:

8. Ensure that all vessel entrances not needed for the loading are blocked and blinded for personnel protection.

9. Supply all personnel entering the vessel with proper protective clothing to prevent contact between catalyst dust and skin.

10. Carefully review the provided catalyst MSDS for any special exposure risks, handling precautions and proper protective equipment. Any personnel entering the vessel must also be provided with a dust mask respirator or, preferably, fresh air breathing apparatus if required by plant regulations. If fresh air masks are not used, air circulation should be provided by some type of air mover to reduce dust levels and maintain a fresh air environment.

## FIXED BED REACTOR LOADING

After pre-loading inspections have been completed, the following loading procedure is recommended:

1. It is important to verify the type of material being loaded before the drum or bag is emptied into the loading hopper. Loading personnel should be familiar with the catalyst identification numbers and appearance. Catalyst should be loaded per the outages specified in the loading diagram. An accurate log of the drum or sack count should be kept enabling identification of any errors. Any deviations should be reported to the Technical Group. Sock is secured to the loading hopper by use of quantity two hose bolt clamp.

2. All inert support balls must be sock loaded and levelled. If multiple layers of support balls are to be loaded, each layer should be levelled prior to the addition of the next layer.

**Caution:** The largest openings in the catalyst support grid or screen should not be greater than one half the smallest catalyst or support ball dimension. Record outages after each layer and confirm with the loading diagram. Care should be taken not to damage any reactor outlet screens present at the bottom of the reactor.

3. The most common method used for loading is to use a large funnel or hopper located above the reactor or on the side of the reactor with a telescoping sock or sleeve extending down to the level of the material being loaded.

4. The hopper and attached sock are then filled with catalyst with flow regulated and distributed by a man working on plywood or planks inside the reactor. As the catalyst is loaded, the sock is periodically shortened as required to hold catalyst free fall to a maximum of 90 cm (36”). If a man cannot be in the reactor as the catalyst is loaded, he has to periodically level the catalyst or have a method of moving the end of the sock for catalyst distribution.

**Important:** The catalyst being loaded should be distributed and levelled as the loading proceeds. Never dump catalyst in one mound and level at the end because such a technique may result in a high concentration of fines in a section of the reactor directly under the loading sock. Such a fines concentration could result in poor flow distribution of the reacting gas across the catalyst bed.

5. After the last drum or sack has been loaded, the catalyst should be carefully levelled using a rake or wooden plank. Record the final catalyst outage prior to the installation of the top screen and support balls.

6. Install the top screen if required and complete sock loading of the upper support ball layer(s). Record the final outage.

7. Make sure that all debris and/or equipment used during the loading is removed from the reactor.

8. Notify the Technical Group for a final inspection and review of the loading data.

9. Re-install the inlet distributor and loading manway cover.

# Revision History

| Rev | Rev Date | Rev By | Approved By | Description |
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**Approvals:**

Procedure Owner

_____ _____
Print Name Date

_____
Signature

# Competency Assessment

| No. | Questionnaire | C/NYC |
|---|---|---|
| Q1 | | |
| A1 | | |
| Q2 | | |
| A2 | | |
| Q3 | | |
| A3 | | |
| Q4 | | |
| A4 | | |
| Q5 | | |
| A5 | | |

| Enclosed Attachments | |
|---|---|
| Risk Assessment | ☑ |
| Environmental Aspect and Impact | ☑ |
| Training and Competency | ☑ |
| Measure and Evaluation Tools | ☑ |

# Competency Checklist

To be filled out by Trainer and signed by Employee, Assessor and Supervisor before being returned to the HSEQT Manager for recording purposes.

| Procedure | Competency | Date | Competent YES / NO | Employee Signature |
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(please tick appropriate box)

This employee is competent in performing the job. ☐

This employee has not attained the competency level. ☐ *

* *If the employee has not attained all competency levels, the General Manager must assess the action to be taken, provide an extension of training or alternative action as listed below.*

Alternate action to be taken : _____

Signed By Employee: _____ Date: _____

Trainer: _____ Date: _____

Assessor: _____ Date: _____

Regional Manager: _____ Date: _____

# Environmental Aspects and Impacts

## Identified Environmental Aspects and Impacts

The following table is a summary of the likely environmental aspects and impacts that may be identified during site inspections. The significance of each impact needs to be assessed using the Risk Assessment Model.

| Activity | Aspect | Impact |
|---|---|---|
| **Purchasing & Administrative Work** | Consumption of goods | Conservation of natural resources |
| | Consumption of energy (eg. Electrical equipment and facilities) | Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss |
| | Generation of waste (eg. Paper) | Consumption of space for waste disposal; Habitat loss |
| **Climate Control** | Consumption of energy | Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss |
| | Generation of noise | Disturbance to community; Habitat loss |
| **Cleaning of – offices / vehicles** | Storage, use and release of chemicals | Contamination of air, water or soil; Risk to human health |
| **Transport (Fleet vehicles / staff travel)** | Consumption of energy | Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Loss of habitat at all stages of generation; Light pollution |
| | Consumption of goods (eg. Oil) | Consumption of natural resources; Generation of waste; Habitat loss; Biodiversity impacts |
| | Generation of waste (eg. Oil) | Consumption of space for waste disposal; Potential contamination of water or soil; Habitat loss |
| | Exhaust emission | Release of greenhouse gases and atmospheric pollution |
| | Use of dangerous goods (eg. Batteries) | Potential contamination of air, water or soil; Risk to human health |
| | Generation of noise | Disturbance to community; Habitat degradation |
| **Operations** | | |
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# Risk Assessment

| Risk Assessment // insert name here | | | | | |
|---|---|---|---|---|---|
| **Step No:** Logical sequence | **Sequence of Basic Job Steps documented in the Procedure, Work Instruction and project plans. Break down Job into steps.**<br><br>Each step should be logical and accomplish a major task. | **Potential Safety & Environmental Hazards/Impacts at the site of the Job**<br><br>Identify the actual and potential health and safety hazards and the environmental impacts associated with each step of the job. | **Risk Rating**<br><br>Refer to the risk matrix or HSEQT.PRO. Risk Mgt | **Recommended Corrective Action or Procedure**<br>***Determine the corrective actions necessary to reduce the risk to as low as reasonably practical (ALARP) refer to HSEQ.PRO.Risk Mgt. The risk must be rediced or controlled to ALARP before work commences.***<br>Document who is responsible for implementing the controls to manage each hazard identified. | **Risk Rating** refer to the risk matrix or HSEQT.PRO.Risk Mgt |
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |

# Audit

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|---|---|---|
| **Process**: insert//<br>**Procedure**: Insert // | Date: | Audited by: |
| | Location of Audit: | Area Mgr/Supervisor: |

| Item | Question | Evidence Sited | Comments | Conformance Score 0,3,5 |
|---|---|---|---|---|
| **1.** | | | | |
| **2.** | | | | |
| **3.** | | | | |
| **4.** | | | | |
| **5.** | | | | |
| **6.** | | | | |
| **7.** | | | | |

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| AUDITOR'S SIGNATURE:<br><br>SAFETY REP'S SIGNATURE: | CONFORMANCE SCORE: / 25<br><br>CONFORMANCE %: | 0 – Non Conformance<br>3 – Continuous Improvement Opportunity<br>5 – Total Conformance |