

Fixed Bed Loading Procedure

January 2023

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, manways, 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 SDS 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 to enable identification of any errors. Any deviations should be reported to the Technical Group of client.
2. All inert support balls must be sock loaded and leveled. If multiple layers of support balls are to be loaded, each layer should be leveled 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. Particular 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 leveled 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 super sack has been loaded, the catalyst should be carefully leveled 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 of client for a final inspection and review of the loading data.
9. Re-install the inlet distributor and loading manway cover.

Inert Loading

The following are procedures for loading of catalyst in single and multi-bed reactors under inert atmosphere conditions.

The general procedures for this work include:

A pre-operational meeting shall be held with both plant operations personnel and IPS★ITCS operations personnel to ensure that the entire scope of work is understood prior to load commencing.

Ensure that a JSEA has been performed.

Ensure that all permits meet the requirements of the JSEA and are properly signed and located as required in the work area.

Ensure that all equipment is on site and in proper working condition.

Revision History

Rev	Rev Date	Rev By	Approved By	Description
1.0	1/3/2022	Shayne Torrans	Shayne Torrans	Initial Procedure
1.1	11/23/2022	Shayne Torrans	Shayne Torrans	Format Revision

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	<input checked="" type="checkbox"/>
Environmental Aspect and Impact	<input checked="" type="checkbox"/>
Training and Competency	<input checked="" type="checkbox"/>
Measure and Evaluation Tools	<input checked="" type="checkbox"/>

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

(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		

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. Each step should be logical and accomplish a major task.	Potential Safety & Environmental Hazards/Impacts at the site of the Job Identify the actual and potential health and safety hazards and the environmental impacts associated with each step of the job.	Risk Rating Refer to the risk matrix or HSEQT.PRO. Risk Mgt	Recommended Corrective Action or Procedure <i>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 reduced or controlled to ALARP before work commences.</i> 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

Process: insert// 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.				
AUDITOR'S SIGNATURE:		CONFORMANCE SCORE: / 25		0 – Non-Conformance 3 – Continuous Improvement Opportunity 5 – Total Conformance
SAFETY REP'S SIGNATURE:		CONFORMANCE %:		