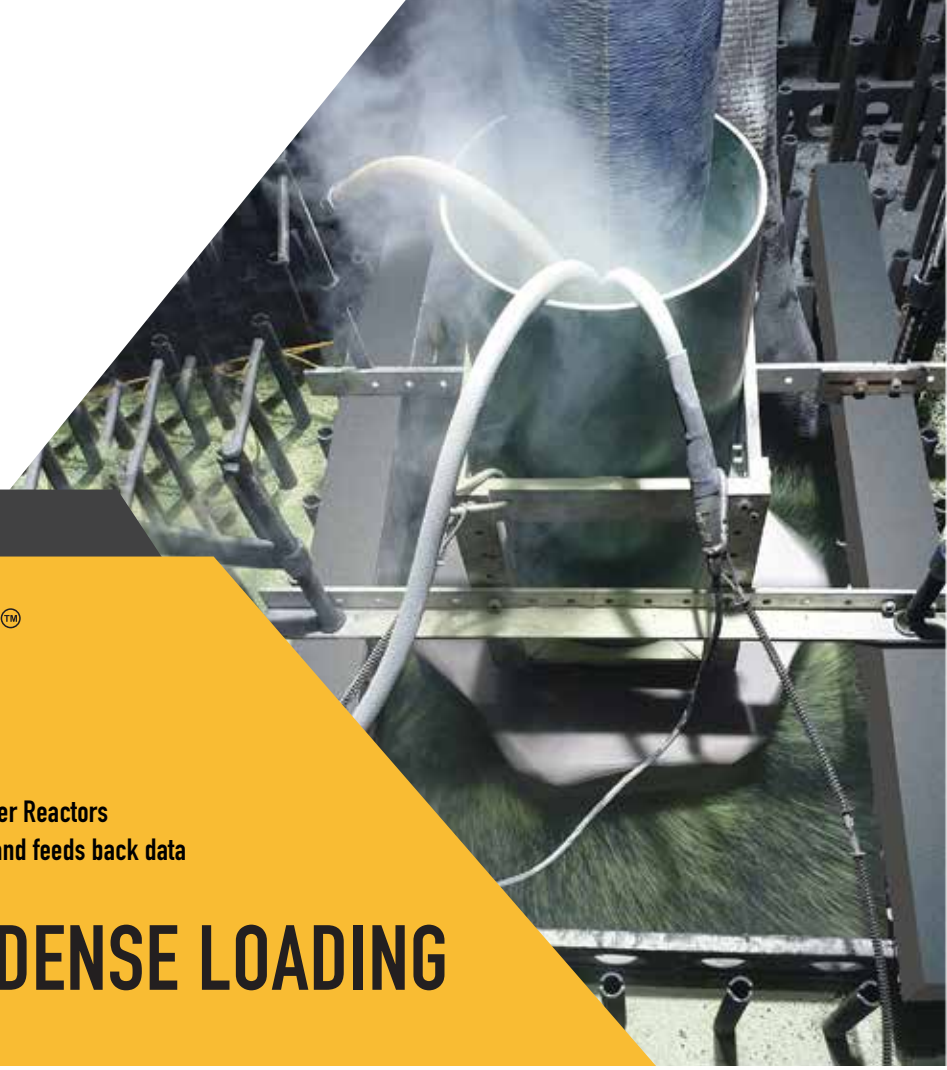
ARTIS™

Confined Space Catalyst Specialists



ARTPAC®

- **Multi Directional Operation**
- **Robust Design and Setup inside Reactor**
- **Greater Loading Rates and Suited to Large Diameter Reactors**
- **Radar Measurement System constantly monitors and feeds back data**

ARTPAC UNIFORM DENSE LOADING

ARTPAC - Dense Loading Technology, has been developed by ARTIS Industrial with a special focus to improve the Catalyst Distribution and deliver consistent catalyst density across beds in large diameter, Multi Bed Reactors.

Learnings and Experience gained by Dense Loading Reactors for over more than 30 Years, have translated to the development of the ARTPAC Loading Machine with Loading parameters for various types and shapes of Catalyst that are used in the Refining/Petrochemical and Fertilizer Industry.

Highlights of the ARTPAC loading system:

- Compact and Robust Design of the Unit for its Motor and Distribution Rotor
- Total of 6 Distribution slots that can be adjusted to load any type and shape of catalyst.
- Bi Directional Operation upto 350 rpm
- Continuous loaded bed measurements , minimizing and eliminating the need for intermediate stoppages for checking the loaded density
- Loading Rates of upto 18 Tons per Hour , based on catalyst type and site loading arrangements
- ARTPAC Dense Loads more Catalyst per bed, than conventional dense loading systems.
- Typical Gain of 15% compared to conventional dense loading that can load only upto 1 mtrs below the Distribution Tray
- ARTPAC Operators , has consistently loaded up to 500mm Below Trays in 5 Mtrs Dia Reactors
- Dedicated Development and Training Facility to continue setting benchmarks in Dense Loading
- Machines positioned strategically across our regions to save time and money on mobilisation
- Qualified and certified loading technicians are part of our catalyst handling crews and when coupled with a complete change out and dense load service significant saving on mobilisation of 3rd party specialists are achieved

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Why Dense load

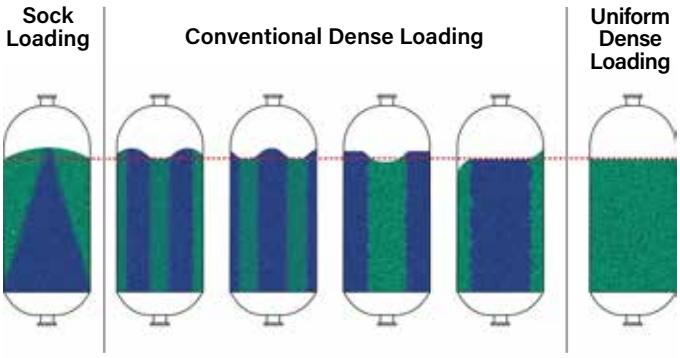
The impact of poor product distribution can have severe and long-lasting effects, but its main cause is often misunderstood. While faulty reactor internals are commonly blamed, poor catalyst loading is frequently the root issue. Poor distribution leads to lower yields, shorter cycles, and increased downtime, all of which significantly raise the total cost of operation (TCO) for each reactor.

Low uniformity refers to significant variations in localized density throughout the catalyst bed, even if the overall density meets expectations. This causes higher-density zones underutilized and prone to hotspots.

Uneven bed profiles, where the top surface of the catalyst bed is tilted or uneven, cause liquid and gas to converge towards the lowest point, creating a preferential flow path.

Technology choice plays a significant role in catalyst loading. Two commonly used methods are sock loading and dense loading.

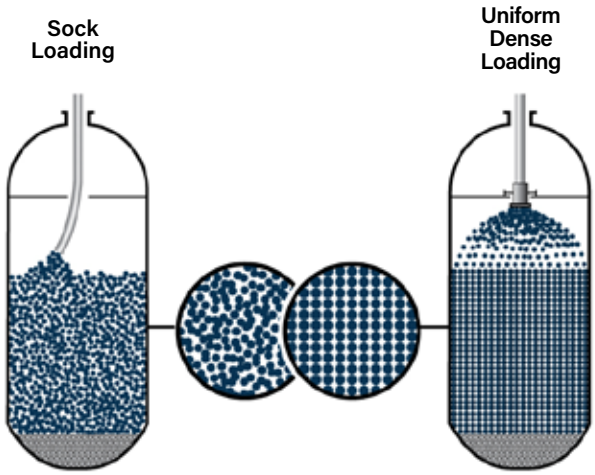
Uniform dense loading (UDL) is a high-quality loading method that utilizes centrifugal force distribute catalyst evenly across various reactor sizes. It minimizes shadow effects caused by internals within the catalyst bed, reducing the risk of liquid and gas poor distribution. UDL offers several advantages over sock and Conventional Dense Loading methods:



Sock loading and conventional dense loading create uneven catalyst bed surfaces, directing fluid flow through preferred zones (illustrated in blue). In contrast, uniform dense loading, with optimized distributor trays, ensures uniform coverage volume of catalyst wetting and a flat top surface

Increased Uniformity

Optimal load rates allow catalyst particles to settle uniformly across the bed volume, improving liquid and gas distribution and reducing hotspot development.



On the left, poor-quality catalyst loading results in poorly aligned particles, larger void spaces, and less total mass. On the right, high-quality loading provides well-aligned particles, smaller void spaces, and a higher total mass of catalysts loaded

Excellent Catalyst Integrity

UDL minimizes damage to catalyst particles and eliminates dust and fine particles.

Strategic Benefits

UDL provides multiple advantages, including improved safety, higher yields, lower TCO, and longer run time with less downtime.

ARTPAC is a proven solution with over 25 years of design improvements, suitable for large diameters and high production rates. It offers an improved compact design, better and more even distribution, experienced operators as part of the crew, and multi-directional operation.

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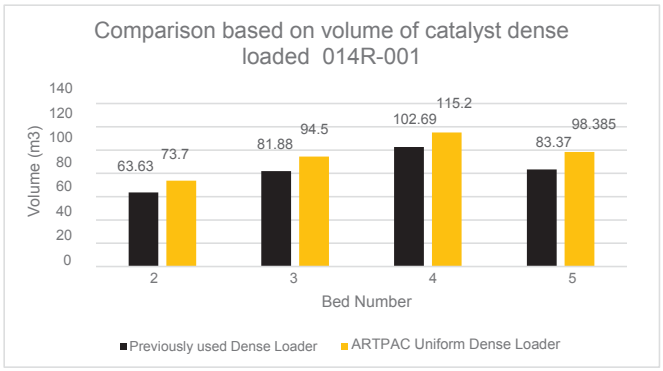
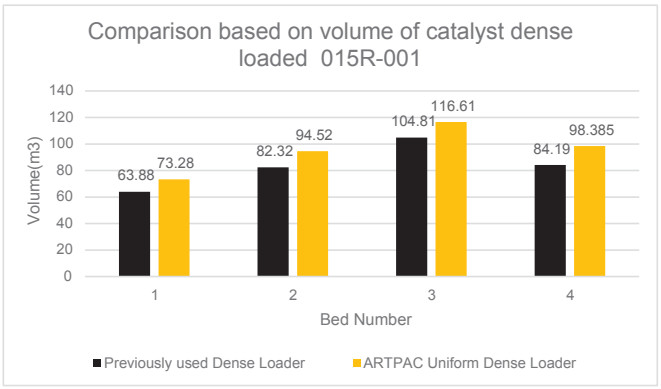
Completed UDL up to 400mm under tray in reactor of 5200mm Diameter

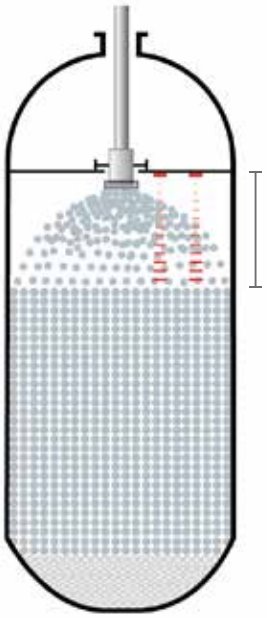




Case study of recently completed loading

Radar Measurement System

ARTIS has developed a proprietary radar system for use during ARTPAC loading to monitor the catalyst bed in real time. This Radar system operates at a frequency that accurately measures the catalyst bed, through dust and falling catalyst grains. By confirming densities and loading profiles, it reduces the need for inspection stoppages. The radar measurement system continuously monitors and provides data to calculate the bed height, density, and profile without interruption.



The radar measurement system constantly monitors and feeds back data to allow the operator to calculate the bed height, density, and profile without stopping

This achieves ±5mm accuracy in level measurements, ensuring a uniform catalyst level. The radar Level transmitter takes readings at multiple points along the Radius of the reactor, creating a graph that represents the catalyst height profile along the radius. These results can then be extrapolated to obtain a complete level of the entire catalyst bed.

Contact Details :

UAE
ARTIS INDUSTRIAL FZC
P.O.Box - 183032,
DUBAI. UAE
information@artisindustrial.com

INDIA
ARTIS INDUSTRIAL PVT LTD
Mangalore, India 575019
information@artisindustrial.com

AUSTRALIA
ARTIS INDUSTRIAL FZC
Melbourne, VIC 3000, Australia
information@artisindustrial.com

NEW ZEALAND
ARTIS INDUSTRIAL NZ
New Plymouth 4340,
New Zealand
information@artisindustrial.com

SAUDI ARABIA
ARTIS LLC
PO Box 20448, PC 31952,
Al-Khobar, KSA
contactksa@artisindustrial.com
`Tel: +966561138789
information@artisindustrial.com

THAILAND
Advanced Refinery Technology Co., Ltd
989 Siam Piwat Tower, 12A Floor, Unit B1-B2,
Office 1207, Rama I Road, Patumwan,
Bangkok 10330, THAILAND
Tel: +6626485027
information@artisindustrial.com