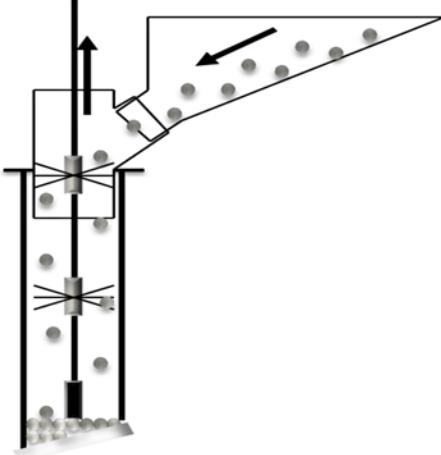


# Automatic Reformer Loading - UNILOADER® by UNIDENSE® Technology

## UNIDENSE®

UNIDENSE® is a simple and fast loading technology for loading reformer tubes with catalyst, applicable to tube sizes from 3" to 10" internal diameter. UNIDENSE® requires no pre-socking of catalyst and no vibration of the reformer tubes. UNIDENSE® combines being a high quality and fast loading technology. Reloading of tubes is normally avoided, and less catalyst is wasted.

UNIDENSE® principle: Catalyst is loaded into the tube and the loading rope is gradually pulled out of the tube as the catalyst layer builds up. The brushes with flexible springs reduce the speed of the catalyst particles so that breakage is avoided. The catalyst particles are loaded without bridges and unnecessary voids, hence there is no need for vibration.



By applying the UNIDENSE® technology the loading time of the primary reformer can be substantially reduced whilst maintaining high quality loading.

UNIDENSE® technology ensures even gas flow in the tubes, and the pressure drop variation is kept to a minimum. The density will normally be higher than with the "sock" method, resulting in slightly increased, but more even pressure drop, due to better packing. Since there are no extra voids, further settling of the catalyst, and thus pressure drop increase, will be minimal. UNIDENSE® gives high uniform density along the full length of the tube, decreasing the risk of hot spots and contributing to lower tube wall temperatures and prolonged tube life.

## UNILOADER®

The UNILOADER® is a machine to automatically load reformer tubes with catalyst using the UNIDENSE® principle. UNIDENSE® is a leading and proven technology used within the SYNGAS market to load primary reformers with catalyst.

The UNILOADER® brings new benefits to the UNIDENSE® technology. The possibility for human error is eliminated as all tubes are loaded at exactly the same manner and speed, resulting in high uniformity and reducing the pressure drop variation to  $\pm 3\%$  (For new reformers,  $\pm 2\%$  is possible). This improved performance is achieved up to 20% faster loading. Attached vacuum cleaner and carefully designed air flow ensures dust-free loading.



UNIDENSE® technology is used for loading of all common catalyst types and sizes. Reformer tube designs with varying internal diameter, narrow or wide top section, have successively been loaded.

For further information, please direct your enquiry to:

## BENEFITS UNIDENSE®

- ✓ Fast reformer loading,
- ✓ No pre-socking of catalyst,
- ✓ No vibration of the tubes,
- ✓ Uniform pressure drop,
- ✓ Less waste of catalyst,
- ✓ No bridging or extra voids:
  - Minimises hot spots,
  - Reduces catalyst settling,
- ✓ High uniform density:
  - Lower tube wall temp.,
  - Prolonged tube life,
  - Increased reforming capacity.

## EXTRA BENEFITS UNILOADER®

- ✓ Human failure eliminated,
- ✓ Improved uniform pressure drop variation  $\pm 3\%$ ,
- ✓ Faster reformer loading (up to 20% faster as manual),
- ✓ Highly uniform loading,
- ✓ Dust-free loading.



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The responsibility for the content of the publication is the author.

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# Pressure Drop (dP) Equipment and Videoscope Inspection by UNIDENSE® Technology

## dP Equipment

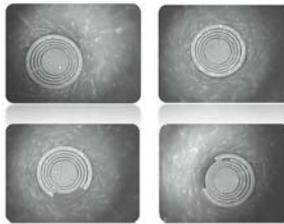
UNIDENSE® Technology provides an accurate and reliable equipment for reputable accuracy of pressure drop measurement. The dP equipment comes complete with a variety of inflatable bladder to cater the clients reformer tube internal diameter size correctly, restriction orifice to achieve critical air-flow during dP measurement test.

The UNIDENSE® dP Equipment is very user-friendly with its light weight design and digital reading up to three (3) decimal points. This increases the accuracy of the measurement and reduces the time consumed without compromising the quality if the data obtained.

## Video Inspection Equipment

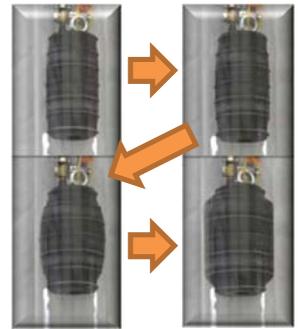
UNIDENSE® Videoscope is the most important equipment required before any catalyst loading activity commence. It helps client to inspect the tube internal to ensure that it is completely empty with no debris, used catalyst or other obstructions remaining. It is also used to determine condition of the outlet catalyst support grid. This camera inspection gives the UNIDENSE® supervisor and client confidence in the tube condition and cleanliness prior to any loading.

Any irregularities observed during the inspection must be corrected immediately and prior to any loadings. Such irregularities are, for example, poor tube cleaning and/or damage to the tube and also the support grid.



## BENEFITS DP EQUIPMENT & VIDEO INSPECTION EQUIPMENT

- ✓ Accurate
- ✓ User-Friendly
- ✓ Simple & Fast
- ✓ Consistent
- ✓ Reliable



For further information, please direct your enquiry to:



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# Internal Tube Cleaning - INTUBE CLEANER by UNIDENSE® Technology

## INTUBE CLEANER

InTube Cleaner is the latest technology advancement to safe and efficient method for internal cleaning of reformer tubes and/or furnace heater tubes, applicable to tube sizes from 3" to 8" nominal diameter. InTube Cleaner incorporates the highest regards towards safety. With the InTube Cleaner, it is the first ever invention specifically built to cater the cleaning requirement for reformer tubes. The InTube Cleaner also has undergone rigorous testing to ensure its functionality is effective and at the same time does not compromise the tube internal metallurgy.



InTube Cleaner principle: It consists of an air-driven motor; responsible for the rotation of a head with steel brushes for cleaning the tubes and at the same time to drive the vertical movement on the tubes for optimum contamination removal such as dust, carbon deposit and scale.

A suction device is also designed to the InTube Cleaner to extract the scales, coked deposit and other contaminant particles which has been dislodged by the cleaning brushes.

### Diagram - Before & After Results Cleaning with the InTube Cleaner



By applying the InTube Cleaner technology the overall cleaning duration for the tube internal can be substantially reduced whilst achieving desired cleaning requirement. It is more efficient than the conventional cleaning method with higher capability to cover more area which are difficult to access. With consideration of "safety" above any other factor, InTube Cleaner is the leading technology in ensuring safe and healthy work environment.

For further information, please direct your enquiry to:

## BENEFITS INTUBE CLEANER

- ✓ Fast reformer tube cleaning,
- ✓ Reduce overall shutdown schedule,
- ✓ Optimize overall cost and potential cost saving
- ✓ Dust-free cleaning,
- ✓ High cleaning efficiency:
  - Improved heat transfer,
  - Prolonged tube life,
  - 100% contact on cleaning surface area



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# External Tube Cleaning - OUTTUBE CLEANER by UNIDENSE® Technology

## OUTTUBE CLEANER

OutTube Cleaner is the latest technology advancement to safe and efficient method for external cleaning of reformer tubes and/or furnace heater tubes, applicable to tube sizes from 3" to 10" nominal diameter. OutTube Cleaner incorporates the highest regards towards safety. With the OutTube Cleaner, it is proven that working in height is eliminated and confined space entry is minimize to essential personnel only. Ultimately time saving is also achieved as the need for scaffolding is no longer required.



OutTube Cleaner principle: It consists of two air-driven motors; responsible for the rotation of a head with steel brushes for cleaning the tubes and to drive the vertical movement on the tubes for optimum contamination removal such as dust, carbon deposit and scale. The OutTube Cleaner is also equipped with an automatic limit switch on the upper part of the machine in order to drive down the unit upon reaching the complete height of the tube.

A suction device is also designed to the OutTube Cleaner to prevent the dispersion of any contaminant particles into the environment and provides a cleaner and hygienic workspace.



By applying the OutTube Cleaner technology the overall cleaning duration for the tube external can be substantially reduced whilst achieving desired cleaning requirement. It is more efficient than the conventional cleaning method with higher capability to cover more area which are difficult to access. With consideration of "safety" above any other factor, OutTube Cleaner is the leading technology in ensuring safe and healthy work environment. It decreases the risk of potential hazards related to working at height and reduces the number of people required to work in a confined space condition.

For further information, please direct your enquiry to:

## BENEFITS OUTTUBE CLEANER

- ✓ Fast reformer tube cleaning,
- ✓ Reduce overall shutdown schedule,
- ✓ Optimize overall cost and potential cost saving
- ✓ No scaffolding required,
- ✓ No working at height required,
- ✓ Reduction of manpower requirement,
- ✓ Dust-free cleaning,
- ✓ High cleaning efficiency:
  - improved heat transfer,
  - Prolonged tube life



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