CAROL ROBOTIC CATALYST HANDLING

Advantages

- Improves worker safety by reducing confined-space entry
- Increases productivity
- Accelerates turnaround time
- Rated for use in Zone 1 and Class 1 Division 2 hazardous areas
- Highly maneuverable
- High-capacity vacuum
- Camera and lighting systems for effective remote control
- Capable of 24/7 operation

CAROL support trailer

The Catalyst Removal Amphirol (CAROL) system is the only robotic solution in the U.S. for unloading catalyst from fixed bed inert reactors. The system reduces or entirely eliminates the need for inert confined-space entry during catalyst changeouts.

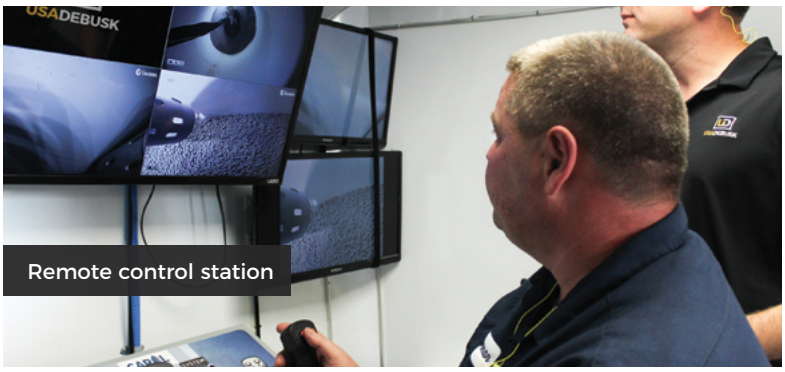
ENHANCED PRODUCTIVITY

The CAROL system provides productivity improvements to save time and money compared to manual unloading:

- Capable of working at a constant rate around the clock
- Avoids the downtime of shift changes, employee rotation and rest breaks
- In some applications, it can be used simultaneously during gravity dumps or may be used while it is still at elevated temperatures to decrease catalyst removal time and standby

COST NEUTRAL

Project costs for the CAROL system are comparable to conventional methods. However, the safety, speed and productivity advantages yield substantially greater value for you.



Remote control station

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CAROL suctions out material

Catalyst exiting continuous-operation knife gates on cyclone

ROBOTIC UNLOADING

The CAROL robot maneuvers inside vessels and suctions out material via its connection to a high-capacity vacuum. The robot is remotely controlled by a technician from the safety of a support trailer. Cameras and lights aboard the vehicle and mounted at the manway allow constant visual surveillance of operations.

The CAROL robot is an amphirol (screw-propelled vehicle) that is designed to sit on top of the catalyst as it vacuums material. A lightweight aluminum frame and large-diameter screws provide a buoyancy effect that helps keep the robot atop a full range of media encountered in catalyst unloading (densities from 40 – 80 lb/ft^3 and particle sizes from 0 – 1 inch).

Twin worm gear propulsion powered by direct-drive hydraulic motors allows the robot to traverse semi-liquid substances. The vacuum head is connected to the robot by a hydraulic cylinder and can be raised and lowered remotely for optimum efficiency.

All in-vessel electrical equipment is rated for use in Zone 1 and Class 1 Division 2 hazardous areas (ATEX, IEC Ex and AEx certification on the camera system).

CAROL ELIMINATES RISK OF MANNED ENTRY AND EXPEDITES REACTOR TURNAROUND TIMES