

# Continuous Catalyst Withdrawal System (CWS)

Improving FCC stability, safety and performance

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## Improving FCC stability, safety and performance

Withdrawing spent (equilibrium) catalyst from the FCC regenerator is a routine but critical operation. In most refineries, catalyst withdrawal is still performed in batches - a process that introduces operational instability, safety risks and equipment wear.

Johnson Matthey's **INTERCAT™** Continuous Catalyst Withdrawal System (CWS) provides a modern alternative, enabling controlled, continuous removal of catalyst while maintaining stable FCC operation.

Designed specifically for the harsh conditions of FCC service, the CWS minimises erosion, minimises changes to circulating inventory and enhances operator safety, while helping refiners to maintain optimal reactor performance and product yields.

## The challenge with conventional catalyst withdrawal

In many FCC units, catalyst withdrawal is performed intermittently using batch-style systems. While widely used, this approach introduces several operational challenges.

When catalyst is withdrawn in large batches, the regenerator (or reactor/stripper) bed level drops rapidly, creating fluctuations in pressure and temperature throughout the unit. These disturbances can disrupt catalyst circulation, increase CO and NOx emissions, increase afterburn, reduce unit stability, impact yields, and reduce overall unit economics.

At the same time, the process involves extremely hot, abrasive catalyst particles traveling at high velocity through pipelines. This can lead to erosion of valves and piping, increasing the risk of leaks and maintenance issues.

Batch withdrawal also exposes operators to high temperature materials during sampling or handling, and hot catalyst discharged into storage vessels can damage downstream equipment or transport containers.

*Batch catalyst withdrawal can disrupt FCC stability and increase equipment wear.*





## A continuous, controlled solution

Johnson Matthey developed the Continuous Catalyst Withdrawal System (CWS) to address the fundamental limitations of conventional withdrawal methods.

Instead of removing catalyst in large batches, the CWS continuously withdraws catalyst at a precisely controlled rate. Advanced control logic maintains pressure balance between the regenerator and the collection vessel, eliminating the operational disturbances associated with batch withdrawal.

The result is stable catalyst level, improved operational control and enhanced safety.

*Continuous withdrawal maintains stable catalyst level and eliminates regenerator upsets caused by batch removal.*



# How the system works

The CWS continuously withdraws catalyst from the FCC regenerator through a controlled and pressure-balanced system.

Sophisticated control logic precisely regulates the withdrawal rate by maintaining pressure balance between the regenerator and the collection vessel. This eliminates the need for conventional throttling devices that are prone to erosion in abrasive catalyst service.

Once withdrawn, the catalyst passes through an integrated heat exchange cooling system, reducing temperatures from typical regenerator conditions (around 1350°F / 732°C) to safe handling temperatures. Cooling the catalyst significantly improves safety while protecting downstream equipment such as storage vessels and transport containers.

The system also manages catalyst velocities within the withdrawal line to minimize pipe erosion and extend equipment life.

Finally, cooled catalyst is collected in a vessel that enables safe sampling and more effective monitoring of the catalyst balance, providing operators with improved control of FCC catalyst management.

*Integrated cooling reduces catalyst temperature from more than 1300°F to safe handling conditions.*





## Key benefits for refiners

- **Improved FCC stability**  
Continuous withdrawal eliminates large regenerator bed level swings, maintaining stable reactor and regenerator conditions. This results in improved emissions control and more stable yields.
- **Improved process monitoring**  
Controlled withdrawals improve ease and accuracy of overall unit catalyst balance.
- **Reduced erosion and maintenance**  
Pressure-balanced design and controlled catalyst velocities significantly reduce wear on valves and piping.
- **Enhanced operator safety**  
Cooling the catalyst before handling minimizes operator exposure to extremely hot materials.
- **Flexible system design**  
The CWS can be configured for a wide range of FCC units, with withdrawal capacities typically ranging from 1 to more than 25 tons per day.

### Proven value for refinery operations

By improving unit stability, reducing maintenance requirements and enhancing safety, the Continuous Catalyst Withdrawal System delivers measurable operational, environmental, and economic benefits.

*Improved FCC performance  
and reduced maintenance.*

### Backed by Johnson Matthey expertise

Johnson Matthey combines deep FCC additives knowledge with advanced process engineering to deliver industry leading catalyst and additives loading and withdrawal systems.

From system design and installation to commissioning and ongoing support, our specialists work closely with refiners to ensure the CWS is optimized for each unit's operating conditions.

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