

## JCA- Jet Cup Attrition Apparatus

**Quantitative determination of the attrition resistance of powdered catalytic materials  
in strict accordance with ASTM D8414 / D8414M.**



The JCA – Jet Cup Attrition Apparatus – is designed for the quantitative determination of the attrition resistance of powdered catalytic materials in strict accordance with ASTM D8414 / D8414M. This standardized method evaluates the mechanical durability of fluid catalytic cracking (FCC) catalysts, catalyst additives, and similar fine materials by measuring their tendency to generate fines under controlled high-velocity air jet conditions. The equipment is intended for quality control, catalyst qualification, inter-laboratory benchmarking, and research and development applications in refinery and catalyst manufacturing environments

The measurement principle defined in ASTM D8414 / D8414M is based on subjecting a precisely weighed catalyst sample, typically 5 grams, to humidified air injected at high velocity into a precision-engineered jet cup. The airflow, maintained at 21.0 standard liters per minute and controlled at 50 percent relative humidity within the disengagement chamber, creates intense particle-to-particle and particle-to-wall collisions. These interactions simulate the attrition mechanisms occurring in commercial FCC units. During the test, fine particles smaller than 20 microns are generated by abrasion and fracture and are carried upward into a fines disengagement chamber, where they are separated and collected in dedicated glass microfiber thimbles. The Jet Cup Attrition Index (JCI) is calculated as the weight percentage of fines produced per hour, providing a direct and reproducible indicator of catalyst mechanical stability

The complete JCA system integrates a wear-resistant jet cup assembly manufactured from highly durable materials to ensure dimensional stability under abrasive conditions. The fines disengagement chamber is designed to prevent re-entrainment of collected particles while ensuring efficient separation of fines below 20 microns. The air supply and control system includes a pressure regulator, mass flow controller, and backpressure gauge to guarantee stable and accurate airflow throughout the test. A dedicated humidification unit continuously conditions the air to meet the relative humidity requirements specified by the ASTM standard. Test sequencing is managed by a programmable timer controlling a three-way solenoid valve, ensuring precise exposure times and repeatable operating cycles. Fines are captured in precision thimbles that allow accurate gravimetric determination using an analytical balance with a resolution of 0.0001g

The standard test procedure consists of two consecutive 20-minute attrition periods, after which the collected fines are weighed and the JCI is calculated in weight percent fines per hour. The apparatus is designed to support the use of control standards, correction factors, and statistical quality control tools to compensate for long-term wear of the jet cup and to maintain inter-laboratory reproducibility. This ensures high repeatability, robust data integrity, and consistency across production sites and research facilities.

By accelerating the simulation of FCC unit attrition behavior in a controlled laboratory environment, the JCA provides rapid and reliable assessment of catalyst durability. Its minimal sample requirement makes it particularly suitable for development laboratories, while its industrial-grade construction ensures long-term operation in routine quality control environments. Through strict compliance with ASTM D8414 / D8414M, the JCA enables standardized comparison of catalyst performance and supports informed decision-making in catalyst formulation, supplier qualification, and refinery process optimization.