Importance of mechanical properties:

The mechanical strength of industrial catalysts and adsorbents is of outstanding importance for their manufacturing and packaging, as well as during loading and operation in the reactors. Two different mechanical characteristics are measured to determine this mechanical strength: the crush resistance and the attrition / abrasion resistance.

VINCI Technologies offers three different testers to measure the attrition and abrasion resistance of granular catalysts & adsorbents:

- ASTM D4058-96 & SPENCE method versatile Attrition Tests (VAT)
- ASTM D4058-96 compliant (Rotating Drum)
- SPENCE method (Rotating Tube)

Both of them address the same property. They differ by the operating conditions of the test (rpm, duration of time) and the size of the sieve used to recover the fines at the end of the test procedure.
**PROCEDURE**

Samples of catalysts (up to four), 25 grams each, are loaded into four cylindrical metal tubes of specific dimensions implemented on a disc-shaped frame.

The frame rotates at a speed of 25 rpm for one hour. At the end of this period of time the content of each tube is recovered and screened over a sieve.

The aperture of the sieve must be 2/3 of the smallest dimension of the granules (this means an aperture of 1 mm for an extrudate of 1.5 mm diameter and 5 mm length). The range of fines here is thus larger than in the ASTM test.

Initial sample, residue on the sieve and "fines" are weighted and attrition is calculated.

**DESCRIPTION**

- It consists of a frame supporting four stainless steel tubes each containing a sample of catalyst and rotating around an axis perpendicular to the axis of the tubes.

- Control box integrated in the stand with on/off switch to power the equipment, a timer set up to control the duration of the test (1-999min) and a motor speed set up (0-60rpm)

- The power requirements are 220 VAC, single phase, 50/60 Hz, 100W.

**CALCULATION**

Attrition is calculated as follows:

Loss on attrition % = 100 x ( P3 / P1 )

Resistance to attrition % = 100 x ( P2 / P1 )

P1 : weight of the fresh sample, after sieving
P2 : weight of tested sample after sieving
P3 : weight of fines

**MISCELLANEOUS**

Dimensions (cm): 35 x 30 x 50
Weight (kg) : 20

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**PROCEDURE**

A sample of granular catalyst (or catalyst carrier, or adsorbent) is loaded in a cylindrical drum which is rotated around its axis for 30 min at a rotating speed of 60 +/- 5 rpm.

The fines produced by attrition and abrasion during the process are recovered by sieving the content of the drum on an ASTM N°20 sieve (aperture: 0.85 mm). The weighing of the residue and of the initial sample allows to calculate the loss on attrition.

**DESCRIPTION**

- Cylindrical stainless-steel drum with a single baffle (all dimensions compliant with ASTM standard) extending the full length of the cylinder

- Lid to prevent fines escaping during the test

- Stand supporting the drum-motor assembly articulated in the center to have three possible and lockable positions: one for easy sample loading, one for the test, the last one being for easy "product" recovery in view of sieving

- Asynchronous motor, single phase, 220 VAC, 50/60 Hz with a reduction gear-box. Power: 100 W

- Control box integrated in the stand with on/off switch to power the equipment, a timer set up to control the duration of the test (1-999min) and a motor speed set up (0-60rpm)

**CALCULATION**

Loss on attrition is calculated as follows:

Loss on attrition % = 100 x ( P1 - P2 ) / P1

P1 : weight of the fresh sample, after sieving
P2 : weight of tested sample after sieving

**MISCELLANEOUS**

Dimensions (cm): 36 x 30 x 48
Weight (kg) : 23
Vinci Technologies is pleased to introduce his new generation, Versatile Attrition Tester (VAT). Thanks to an adaptor, the VAT can be used as ASTM 4058 tester (Rotating Drum) or as SPENCE method tester (Rotating Tube). The specifications are the same with the previous individual apparatus.