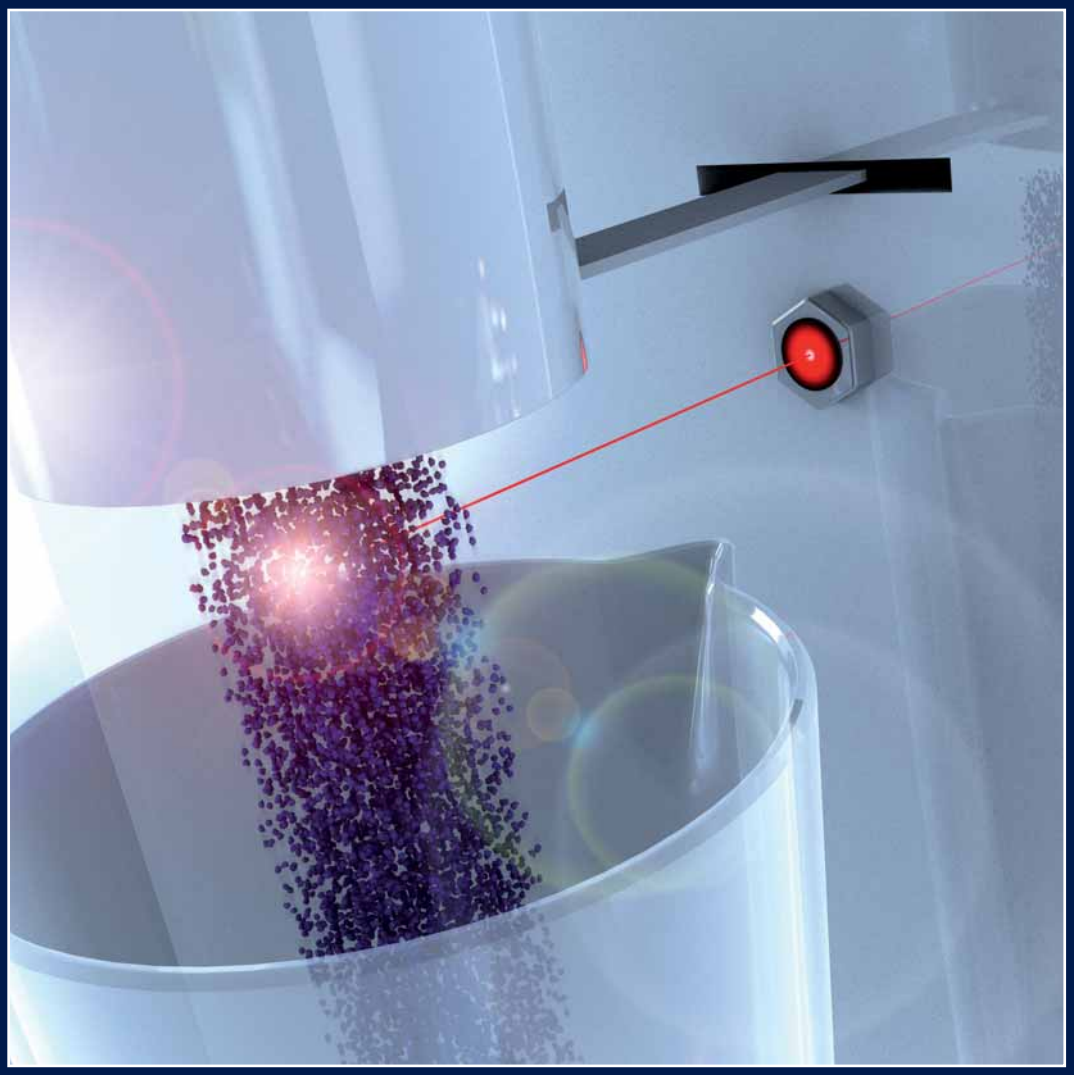
HAVER ANALYTIK



# HAVER® ANALYTIC TEST EQUIPMENT

# HAVER® ANALYTIC

**HAVER & BOECKER is well known for its premium products made in its Wire Weaving and Machinery Divisions. Now we are expanding the term quality to new dimensions.**

■ HAVER® Analytic

We not only produce top quality wire cloth, screening machines, and packing machines, but we also assist our customers in measuring and monitoring the promised levels of quality! For us the term quality also extends to the products for final customers. This is the ultimate target of mutual cooperation: HAVER® customers must be assured that their products go to market only with the highest possible quality – year after year and day after day. It has to be documented in writing and be traceable.

**Quality control and documentation have gained in importance.**

HAVER® Analytic is a developer, manufacturer of laboratory equipment and a service provider of equal proportion. Try us out and you'll be convinced. We're at your service worldwide around the clock.

**Recording process related product properties in the areas of:**

- building materials
- cement
- food and feed products
- chemicals

**A selection of the wide range of applications:**

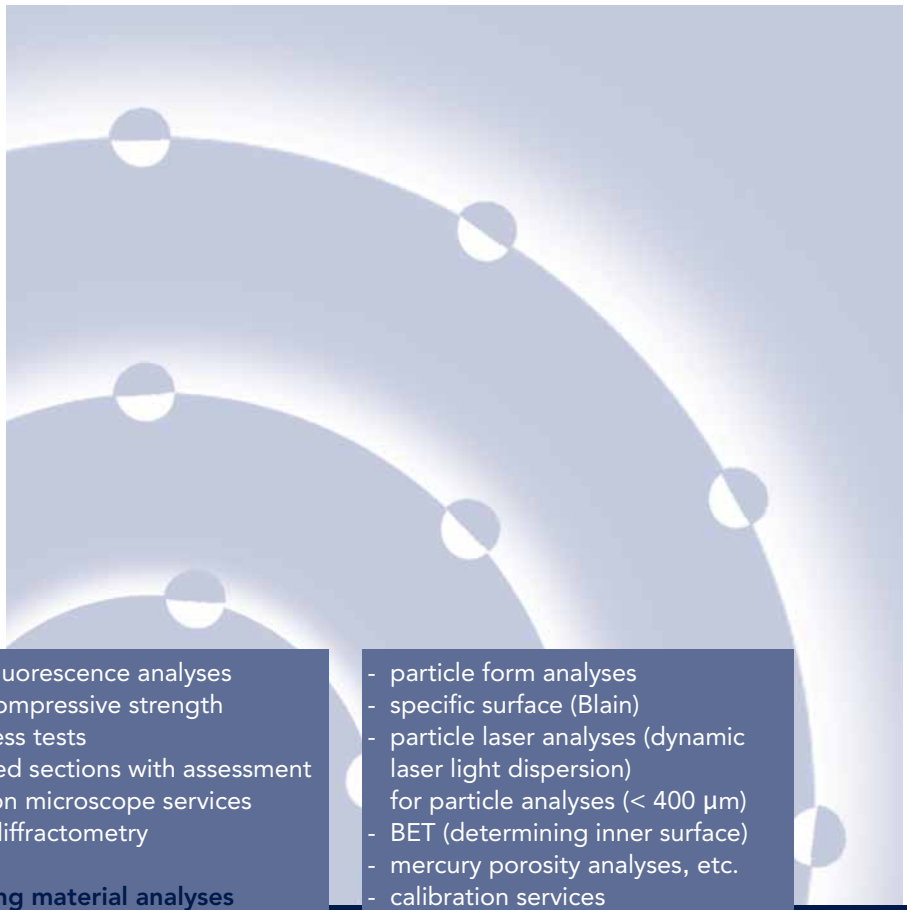
- silo technology
- filling technology
- transport and logistics
- production
- laboratories
- particle measurement technology
- bag manufacturing
- packaging testing

# YOUR QUALITY IS OUR TARGET

# PRODUCT ANALYSIS + PACKAGING ANALYSIS =
## DETERMINING THE OPTIMUM PROCESS TECHNOLOGY

**Instruments for analysis**
Our field-tested analysis instruments lead to economical packing solutions for loose bulk materials. They allow process-relevant product properties to be measured and recorded. During changeovers to other products, changes in product quality or changes in packaging material, the necessary adjustments to the machine settings can be determined by using the tests. The HAVER® ANALYTIC instruments were developed because of our comprehensive experience in real-life packaging. They not only allow objectification of data, but also enable analysis comparison over time.
Our range of equipment is continuously expanded to keep pace with market and customer requirements.

**Analysis process**
We conduct a wide variety of tests as a service for our customers in our own laboratory. It is our aim to provide assistance in detecting and solving problems. We'll gladly advise you upon request.



**Product analyses**
- bulk density
- pourability
- product moisture content
- compaction volume
- ability to flow
- natural slope
- dewatering properties
- de-aeration properties
- minimum ignition energy
- flame temperature
- dust properties
- grinding and milling trials
- mix agglomeration
- agglomeration on pelletizing plates (400 and 1000 mm Ø)
- shearing tests (frictional coefficient)
- compression trials
- specific weight (density)
- pH value
- decomposition analyses
- LOI (loss of ignition)
- moisture measurement

- x-ray fluorescence analyses
- cold compressive strength
- hardness tests
- polished sections with assessment
- electron microscope services
- x-ray diffractometry

**Packaging material analyses**
- hot tack trials (PE and paper)
- tensile tests
- Big Gurley
- bag air escape capability
- drop tests
- weld seam trials (impulse/ultrasound)
- Seal Tester
- Film Tester

**Particle analyses**
- dry screening
- wet screening
- photo-optic particle analyses (CPA)
- particle and particle size distribution

- particle form analyses
- specific surface (Blain)
- particle laser analyses (dynamic laser light dispersion) for particle analyses (< 400 µm)
- BET (determining inner surface)
- mercury porosity analyses, etc.
- calibration services

**Process analyses**
- D-SOLV Tester
- laboratory mixers (liquid)
- pelletizing plates
- concentric shearing units
- Hydro-Clean
- washing trials
- shearing trials
- vibration analyses

# HAVER® BULK DENSITY TESTER

## Using the HAVER® BULK DENSITY TESTER, the bulk density of powder or granular-type materials is determined.

The sample is measured using a precisely specified volume and then weighed by the customer. The loose bulk density is needed for checking the structural uniformity of loose materials in production processes.

Even the bulk density of poorly flowing, cohesive, lumpy or brittle loose bulk materials can be determined with reproducible results using the HAVER® BULK DENSITY TESTER.

In Germany alone there are about 20 known norms for determining the bulk density of a loose material. Our process is closely related to DIN ISO 697 and ISO 60 norms respectively.

### Areas of application:

- rapid and easy determination of product-specific data, e.g. in:
  - plant laboratories
  - production
  - filling systems
  - the logistics chain
  - university laboratories

### Proof of our product quality:

- rapid and easy determination of a material's bulk density
- reproducible results through precise work
  - chemical-resistant wiper
  - defined position for the measurement cup
- practical size
  - 500 ml measurement cup
- low maintenance and low wear operation
- easy to clean
  - easy disassembly without tools

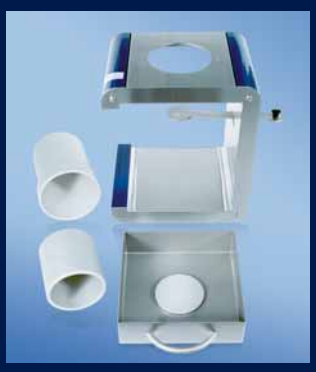
### Additional component:

- precision weighing scale

**Technical data:**

| | weight | width | height | depth | measurement range |
|---|---|---|---|---|---|
| HAVER® BULK DENSITY TESTER | 10 kg | 260 mm | 340 mm | 205 mm | 1dm³ |



# HAVER® TRICKLE TESTER

## A loose material's pourability can be easily determined using the HAVER® TRICKLE TESTER.

The time needed for the material to flow from a discharge hopper and its pouring characteristics are evaluated. Depending on the material properties, different types of hoppers with different diameters are used. The quality of a product can be monitored and quality deviations can be detected as a result.

Differences between fresh and previously stored products, batch differences, different grades, product layering or material admixtures can be qualified. In addition separation properties can be determined.

### Areas of application:

- products capable of trickling that flow into a process with precise repeatability and control, e.g. in:
  - silo systems
  - filling systems
  - transport and logistics
  - production

### Proof of our product quality:

- necessary analysis of product properties in the production process
  - set of hoppers allows a broad range of application
  - product classification by hopper size
- reliable results with respect to possible filling speeds
  - transportable, can be used at various locations
  - molded hand grips allow ergonomic handling
  - standard electrical supply is all you need
- easy operation: everything included inside a housing; display and operating controls are logically positioned


HAVER® TRICKLE TESTER in operation


**Technical data:**

| | weight | width | height | depth | power ratings | measurement range |
|---|---|---|---|---|---|---|
| HAVER® TRICKLE TESTER | 25 kg | 500 mm | 700 mm | 330 mm | 100 – 240 V AC<br>47 – 63 Hz | 0 – 9999.99 sec |





# HAVER® DEAERATION TESTER

## Using the HAVER® DEAERATION TESTER, the aeration and deaeration characteristics of powder, micro-granular, gritty and blended products can be determined.

In addition the product's air flow-through resistance is assessed. Using a defined air pressure, the instrument can simulate air flow in both the packing machine and in the silo. Many parameters can be determined by this test unit and their interactions can be assessed:

- air pressure (mbar) = manometer
- air quantity (l/min) = air quantity gauge
- air intake due to changes in product volume (cm3) = graduated measuring column

### Areas of application:

- Products that are conveyed in a fluidized state and for which the bulk material properties and aeration characteristics must be determined, e.g. in:
  - silo systems
  - filling systems
  - production

### Proof of our product quality:

- optimized filling process through energy efficient product flow in an aerated conveying system
  - determine the interaction between the air retention capability and the ability to flow
  - simulate product fluidization during the filling process
- optimized aeration (amount and method)
  - determining the minimum fluidization air amount
  - determining the pressure drop / time
- quality control
  - determining the aeration behavior
- easy cleaning
  - removable measurement column

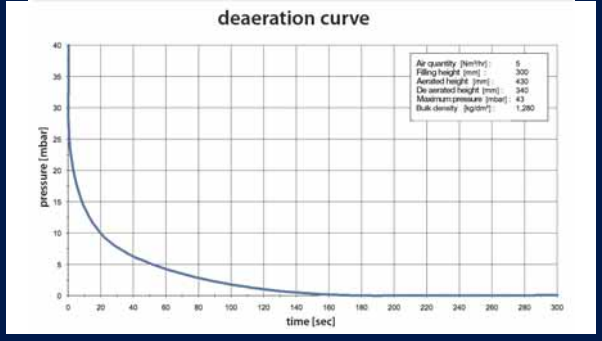
### Additional components:

- automatic monitoring and recording of measurement data on a PC
- exhaust hood with suction line
- exhaust filter with de-dusting
- PC interface including software

HAVER® DEAERATION TESTER with an exhaust hood with suction line

**Technical data:**

| | weight | width | height | depth | power ratings | measurement range |
|---|---|---|---|---|---|---|
| HAVER® DEAERATION TESTER | 55 kg | 850 mm | 1125 mm | 350 mm | 230 V AC<br>5 bar | 0 – 100 mbar<br>0 – 6 m³/hr |



# PARTICLE ANALYSES

## MEASURE, ANALYZE, AUTOMATE

**This product range consists of a wide variety of products for particle measurement technology and laboratory.**

It includes sieve analysis machines that automatically screen products into various size ranges. Reproducible screening results are yielded in just a short time. All sieves are high-performance, robust and easy to maintain. Their integrity has been proven over years of field-use.
HAVER® analysis sieves are manufactured according to applicable national and international norms: DIN ISO 3310, ASTM E 11, BS 410, AFNOR, etc..

**Areas of application:**

- different models are available for dry or wet screening and depend on the material to be screened

Further information about the area of particle measurement technology can be found at:
www.diedrahtweber.com/de/pa
www.diedrahtweber.com/de/cpa

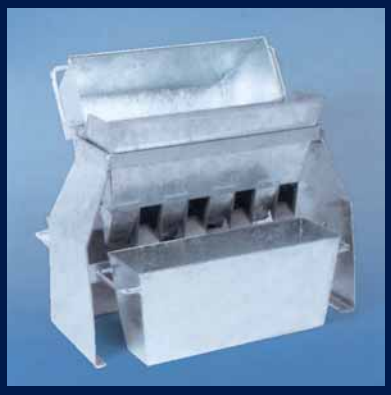
**High quality through technical expertise:**

- flawless screening results require clean analysis sieves
  - HAVER® USC cleaning units
  - thorough and gentle cleaning
- photo-optic determination of particle size and shape distribution
  - HAVER® CPA product range for particle size analysis and particle shape distribution from 10 µm to 400 mm
  - the HAVER® CPA particle measurement unit scans free-falling particles using a high-speed CCD camera
  - the camera's high number of pixels can record over a wide measurement range
  - the HAVER® CPA machines can also be integrated in the production process as an online variant and serve to regulate machine settings
- computer aided evaluation of norm-complying sieve analyses
  - HAVER® CSA software
- separating material extractions Into representative test samples. With the HAVER® furrowed sample splitter, dividing the material into two parts takes place through the alternating dIscharge position of the unit head.


HAVER® CPA, photo-optic particle size and shape analysis


HAVER® sieve analysis machines with 3-dimensional screening movement and automatic amplitude control

HAVER® analysis sieves for reproducible sieve analyses



HAVER® furrowed sample splitter

HAVER® USC 200 Multi can clean up to 5 analysis sieves simultaneously

# HAVER AIRFLOW TESTER®

## BAG TESTING UNIT

**The HAVER AIRFLOW TESTER® determines the air escape capability of a bag and thus the filling behavior of the entire bag, including all paper and plastic layers and their glued areas.**
**The data provide important information on filling behavior.**

By including all components that make up the bag – especially the glued areas – a complete assessment is the result. Various batches, bag changes and degrees of soiling can be tested in order to make the optimum bag selection.

### Areas of application:

- bag manufacturing
- filling technology
- transport and logistics

### Proof of our product quality:

- optimization of bag manufacturing by determining the relevant parameters
- determining optimum machine speed through the targeted selection of a valve-bag
- exact results provided by three different, individual air quantity measuring instruments
  - filling spouts with inflatable sleeves that effectively seal off the bag valve
  - various, rapidly exchangeable filling spouts for different valve sizes (1 filling spout delivered, additional spouts available at a nominal price)
- check of conformity with specifications
- easy to operate after a very short introduction
- zero-wear operation: enclosed system mobile use: mounted on wheels
- reduced maintenance costs
- reduced operating costs saves energy, only a compressed air supply is needed

### Additional components:

- five different filling spouts for bag valve sizes ranging from 75-220 mm (75-90, 90-120, 110-140, 135-170 and 170-220 mm)
- HAVER® calibration instruments
  - manometer readjustment
  - check for internal leaks
  - check of the three air quantity instruments


HAVER AIRFLOW TESTER® in operation

**Technical data:**

| | weight | width | height | depth | power ratings | measurement range |
|---|---|---|---|---|---|---|
| HAVER AIRFLOW TESTER® | 150 kg | 900 mm | 1300 mm | 400 mm | 5bar | 0.6 – 6.5m³/hr; 5.0 – 50.0 m³/hr<br>10.0 – 160.0 m³/hr |


The HAVER® calibration unit allows annual testing of the HAVER® AIRFLOW TESTER's accuracy.


The unit comes inside a convenient case.

HAVER AIRFLOW TESTER®: integrated storage rack for multiple filling spouts

# HAVER® BIG GURLEY

## AIR PERMEABILITY ASSESSMENT OF BAG MATERIALS

**Using the HAVER® BIG GURLEY the air permeability of the packaging material can be measured and evaluated.**

Continuous quality monitoring of bag material is important during bag manufacturing. To do this, special information on the porosity and air escape properties of the bag components are necessary. By adding loose material in the measurement chamber, it is possible to determine air permeability changes of product-sprinkled bag materials.

**Areas of application:**

- bag manufacturing
- filling systems
- transport and logistics

**Proof of our product quality:**

- enables packaging optimization with respect to paper, plastic, inliners and permeabie fleece
  - modern measuring system for testing single layers or multiple layers simultaneously
  - very exact and uniform air pressure also with large air quantities
- permeability properties with or without loose material influences are measurable
  - ventilating the measurement chamber through a specified wire mesh
- supports and shortens the development time of new packaging materials
- operator-friendly
  - optimally arranged operator controls and displays
  - digital display of measurement results (m³/hr)
- digital display easily checked for accuracy
  - exhaust flap is set for a defined air consumption
- check for internal leaks
  - blind panel
  - various measurement ranges possible: 150 cm³ and 300 cm³

The easy-to-use HAVER® BIG GURLEY

**Technical data:**

| | weight | width | height | depth | power ratings | measurement range |
|---|---|---|---|---|---|---|
| HAVER® BIG GURLEY | 70 kg | 600 mm | 575 mm | 585 mm | 100 – 240 V AC<br>47 – 63 Hz | 0 – 100 m³/hr |

| HAVER® BIG GURLEY Test | | | |
|---|---|---|---|
| Measurement value | | | |
| Measurement | Outer layer m³/hr | Inner layer m³/hr | Contamination of outer layer m³/hr |
| 1 | 4.8 | 6.8 | 3.1 |
| 2 | 5.3 | 6.4 | 3.3 |
| 3 | 4.8 | 6.6 | 3.3 |
| 4 | 3.9 | 5.9 | 2.4 |
| 5 | 3.3 | 6.1 | 2.7 |
| Average value | 4.4 | 6.4 | 3 |

# HAVER® BAG DROP TESTER

## Using the HAVER® BAG DROP TESTER, drop tests on filled bags can be carried out effectively.

Filled bags weighing up to 25 kg and with maximum dimensions of 900 x 700 mm are elevated to an adjustable height and then dropped either flat or standing up. The results allow conclusions to be drawn on the bag's quality and toughness.

Especially the bag's welded seams are often subjected to high loads, for example when stacked on pallets. In addition to the toughness of a packaging material and its welded seams, this unit also allows the integrity of perforations and embossing to be assessed.

### Areas of application:

- bag manufacturing
- filling technology
- transport and logistics

### Proof of our product quality:

- quality testing
  - load capacity of bags; especially for bags with hazardous materials
  - testing of welded seams
- easy operation increases operating safety
  - clearly arranged operating panel
- practical drop height of 700-2000 mm, steplessly variable
  - integrated lift mechanism
  - the trap door is activated via the operating panel
  - heavy lifting by the operator is eliminated as the filled bags are automatically brought to the specified drop-height
- rapid cleaning
  - extractable dust pan
- reduced operating costs
  - saves energy, only compressed air supply is needed

**Technical data:**

| | weight | width | height | depth | power ratings | measurement range |
|---|---|---|---|---|---|---|
| HAVER® BAG DROP TESTER | 550 kg | 1800 mm | 2700 mm | 1800 mm | 5 bar | 0.7 – 2 m |

# MINERAL PROCESSING TECHNOLOGY

## SCREENING TRIALS


**For dimensioning and designing our screening machines and optimising screening decks and machines, HAVER & BOECKER operates a dry and wet screening R&D Center for mineral processing technology. Here screening trials can be conducted on materials with a particle size of up to 25 mm and a cut size ranging from 0.04 mm to 18 mm.**

We have more than 75 years of experience in screening and processing technology which enables us to successfully carry over results achieved in our R&D Center to industrial application in the field. Our main focus is on the flexible and versatile execution of trials based on scale-up trials. The most up-to-date machines and plant technology are also requirements, including extensive process data recording and analysis systems.
Our experienced workers first determine your specific needs and then draw up efficient and sustainable solutions while keeping investment and plant operating costs to a minimum.

**At our R&D Center we have at your disposal the following screening machine types from our product range:**

- **NIAGARA® eccentric screens**
- **circular free swingers**
- **linear vibration screening machines**
- **high frequency screening machines**

**Some of these machines are also available for field trials at our customer locations and may be rented.**

**In our R&D Center we can examine classification, defillering, dewatering and foreign material screening for:**

- hard stone and ore processing
- quartz sand
- gravel, crushed stone and sand processing
- fertilizers
- chemical products
- building rubble and recycling
- dry mortar
- limestone
- glass
- difficult to screen products

**Adjustable parameters:**

- stepless rotational speed adjustment
- stepless amplitude adjustment
- motor setting adjustment from 38°- 50°
- inclination angle

**Proof of our product quality:**

- more than 75 years of experience
- selection of six screening systems
- more than 200 available screen cloths
- analytic equipment, screen cloth, machine technology and service from one provider

# MINERAL PROCESSING TECHNOLOGY

## WASHING TRIALS

**For laying out our innovative HAVER Hydro-Clean® washing system and for examining the material washability, we offer various possibilities to determine washing resistance.**

By using a wet screening analysis in accordance to DIN EN 12620, it is possible to determine the share of material that can be washed off. A material's resistance to washing is also determined by using our self-developed laboratory washer.
It is also possible to conduct washing trials for a shearing type of loading stress in a concentric shearing fixture. For real-life washing trials, we have a mobile trial unit available. The unit has a capacity of up to 20 tons/hr, is equipped with a HC 350 Hydro-Clean® and a downstream classifying screen. Trials generally take place on site.

### Areas of application:

- ore, mining
- sand, gravel and crushed stone
- mineral processing
- recycling

### General types of application:

- discontinuous screening rate trials
- continuous trials for determining operational behaviour
- dewatering trials

### Process variants:

- recirculation process without water spraying
- recirculation process with water spraying
- discontinuous wet screening with water spraying
- discontinuous dewatering trials

### Trial variants:

- wash-off analysis
- bulk density determination
- water content determination
- washing-resistance determination (laboratory washers, concentric shearing fixture)
- slip angle determination
- trickle behaviour determination
- microscopic particle shape analysis
- long-term trial – part check (up to 24 hr)
- long-term trial – contract screening (up to 24 hr)
- decomposition analysis of agglomerates in liquid media

### Proof of our product quality:

- **efficiency test:**
  - reduced water consumption
  - reduced operating costs
- **quality test:**
  - excellent washing results (pores, crevices)
  - standard PU insertable screen decks for protection against wear for optimum energy use

The high pressure water jet symbolizes the functional principle of the Hydro-Clean.

Depending on the size, the machine is equipped with up to 38 jet nozzles.

# MINERAL PROCESSING TECHNOLOGY

## HAVER® VIBRATION ANALYSIS

**The HAVER® Vibration Analysis is a highly efficient instrument for the upkeep and maintenance of screening machines and mineral processing systems and can make a valuable contribution to better operating results. This self-developed measuring instrument analyzes and visualizes the operating behaviour of your vibrating screening machines.**

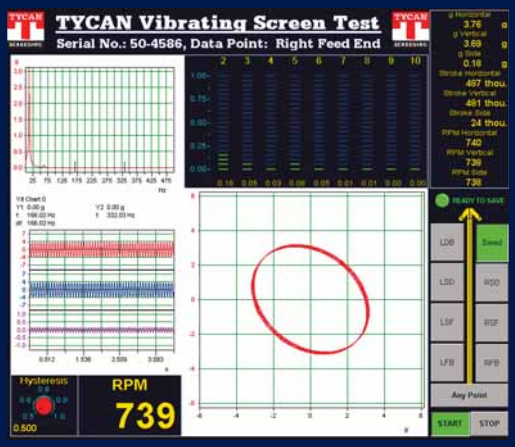
You can order the HAVER® Vibration Analysis as a service for every model and brand name of vibrating screening machine. As an organizational part of our final inspection, a vibration analysis is carried out on every outgoing screening machine. This assures that only optimally adjusted machines leave our factory.

**Areas of application:**

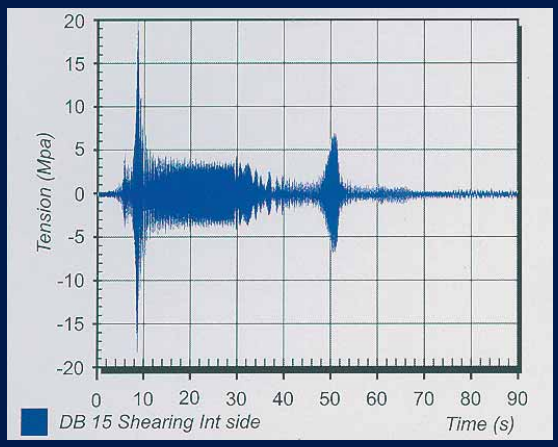
- primary scalping or relieving of crushers
- armourstone screening
- hard stone and ore processing
- classifying of difficult-to-screen materials with high loads and fluctuating material input
- gravel, crushed stone, sand and quartz sand processing
- fertilizer and chemical products classification
- building rubble classification
- limestone classification
- washing and de-watering
- wet classifying
- lime classification
- dry mortar classification
- dry classification of fine, loose materials
- glass classification
- defillering

**Proof of our product quality:**

- higher productivity through constant measurement of screening performance
- can be used for every brand of vibrating screen and model
- assures optimum machine efficiency
- simple visualisation and call-up of measurement analyses




The user surface of the analysis system is the only one of its kind on the market that displays horizontal and vertical vibrations of a screening machine at the same time.




Deformation analyses using strain gauges are a prerequisite for continuous, uninterrupted operation of special screening machines over years.

# MINERAL PROCESSING TECHNOLOGY

## PELLETIZING

**HAVER® Scarabaeus stands for innovative agglomeration technology. For laying out processing systems and facilities, HAVER ENGINEERING Meißen, as an associated institute of the Engineering University Bergakademie Freiberg, offers feasibility studies.**

The processes of mixing agglomeration and agglomeration build-up can be displayed and individual jobs can be addressed in our research facility. The agglomeration properties of various materials can be determined with respect to conditioning, machine and process parameters, and optimized by using existing product quality requirements. Output materials, semi-processed, and final products can be evaluated by using physical, chemical and mineralogical analysis methods according to international standards or customary processes.

### Areas of application:

- iron ore and other ore
- steel mill waste material
- fly ash and dust
- building material products
- mineral and organic fertilizers
- slurries
- chemical products
- animal feed additives
- pigments and other fine particle materials

### Analysis processes:

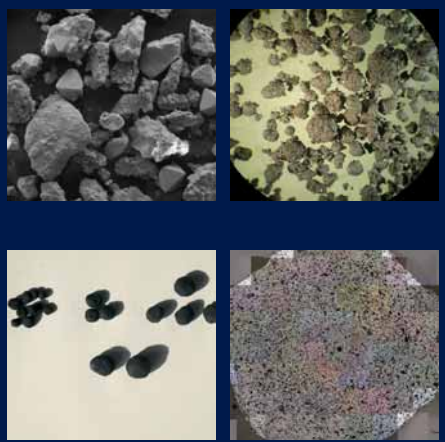
- particle size distribution and particle shape, down to 4 µm
- pure density, bulk density, repose angle and moisture
- specific surface and porosity
- polished surface analysis and permeability measurement
- falling number and particle strength
- chemical, mineralogical and metallurgical examinations to your order

### Proof of our product quality:

- adjustment of the optimum pellet properties
- determining optimum process parameter


Pelletizing trials with concentrated iron ore on HAVER® Scarabaeus 1000-Pelletizing plate

- scale-up to optimise machine and process layout
- shorter start-up times
- increase in product output
- flexible and effective switch-over to changing demands



HAVER® Agglomeration Research Center at the TU Bergakademie Freiberg Germany

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