

JOEST Shake Out Type TWFE with electronically adjustable oscillation angle

Application

Shake Outs are used to separate sand and castings right after the mould ejector in a green sand molding plant. The cast runs over a grid, whilst the sand lumps are broken down by the energetic vibrations and fall through the grid.

A TWFE Shake Out is equipped with a special drive arrangement (four exciter blocks) which is powered by two stationary three phase motors. The motors have built-in sensors that give the electric control module real time information about the current position of the flyweights.

The essential oscillation parameters can be dialed into the electric control module:

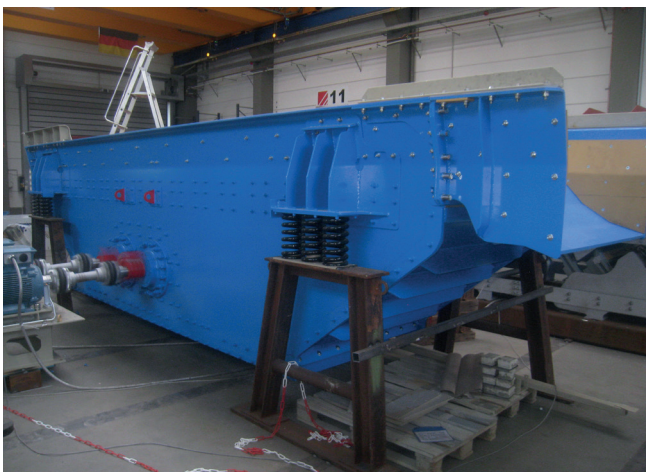
Oscillation angle	adjustable 50-85°
Oscillation frequency	adjustable 16-25 Hz
Oscillation amplitude	fixed; about 4,2-4,5 mm

The machine parameters that are necessary for a good sorting result are strongly dependent on the casting part:

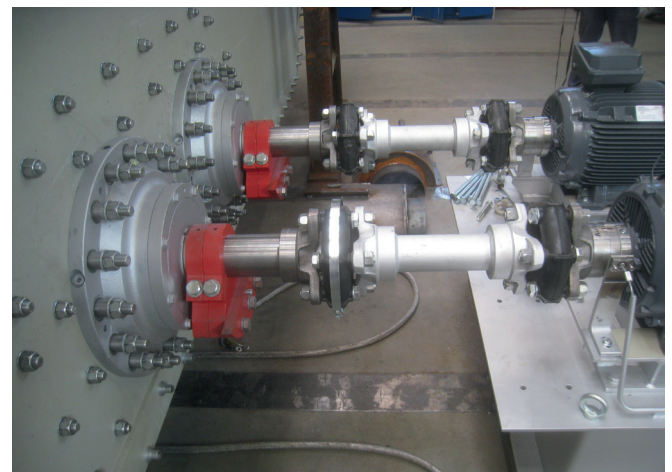
Small, light-weight castings have little thermal impact on the sand and are robust towards damages. In this case the Shake Out can be adjusted to a steep oscillation angle; that means a more effective break down of sand.

Large, heavy castings have a big thermal impact on the sand and are more sensitive to damage. For castings like that, the Shake Out can be adjusted to a flatter oscillation angle, since the sand is easier to break down.

Steep oscillation angles result in a large vertical oscillation proportion which improves the breakdown of the sand. A slow forward motion of material and thus more time spent on the grid also leads to a higher number of impulses that impact the material during the conveying process. For flat angles, the opposite applies respectively. Typical oscillation angles lie between 60 and 70 degrees.



SHAKE OUT TWFE

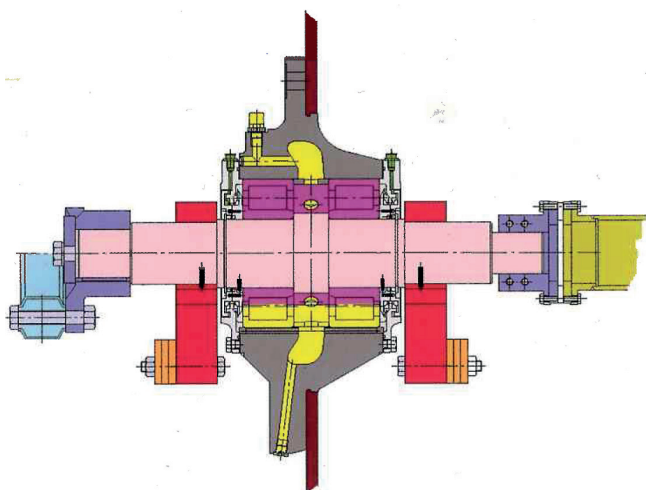


DRIVE ARRANGEMENT 4 WE

At 25 Hz oscillation frequency, the vertical acceleration of the harmonic oscillation in such a machine lies between 40 m/s^2 and 55 m/s^2 . It can be calculated using the parameters mentioned above: frequency, amplitude and angle of oscillation. The vertical acceleration is the statistical value that determines how far the sand lumps are broken down. A mindful and considerate design is crucial here, because naturally, the castings are exposed to the same oscillations as the sand lumps. There is no point in the sand being broken down completely when numerous castings are damaged in the process. A change in frequency has a quadratic influence on the change of acceleration; a change in amplitude has a linear, proportional effect.

Design

Mainly bolted / riveted, modular steel design with the main assemblies: side walls, beams and grids. Special feature of JOEST Shake Outs with a heavy-duty design: The two side-walls are monoplate lasered parts; all components between the sidewalls feature machined load attachment plates and are bolted or riveted, making them exchangeable. The sidewalls are completely free from welding seams in order to prevent the steel's microstructure from being exposed to punctual heat.



ADVANTAGES

- ✓ electronically adjustable oscillation angle from 50° to 85°
- ✓ Siemens standard components in the control unit, S7 SPS
- ✓ Emergency operation immediately available without electronic control
- ✓ Driven by standard three phase motors
- ✓ Each exciter block has its own oil sump
- ✓ Thermal stability of the exciter blocks through exposed mounting position
- ✓ Separate, detachable, handy exciter blocks, service enabled „on the work bench“
- ✓ Little lateral space required when detaching the exciter blocks
- ✓ Long bearing lifetime due to a good seal and heat transfer from the blocks to the machine's side walls
- ✓ Wear resistant grids from manganese steel 1.8715 (full material), easily exchangeable
- ✓ Proven, angled trapezoid grid perforation prevents clogging
- ✓ Suspension as requested, compression springs or hollow rubber buffers

Grid surface of the Shake Out

The grid surface is made up of 400mm long, and 30mm thick grid segments. The highly wear resistant manganese steel grid segments are bolted to the crossbeams. The grid surface features a special hole geometry; Trapezoid holes that are tilted opposite the conveying direction, widening slightly towards the bottom with zero overlap. This geometry effectively prevents castings from jamming in the grid surface. The grids are manufactured in-house at JOEST with a specially modified flame cutting machine. The open grid area is roughly 33%.

The grid's surface is purposely designed very flat and even, without steps or edges standing out. Steps or edges always lead to damages in the casting because while passing over the edge the cast experiences a Hertzian pressure that is too high.

Drive

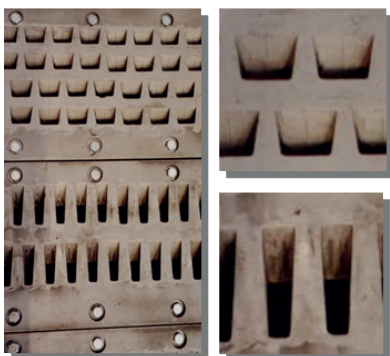
The drive system is designed discreetly. The system is driven with four sealed, sump lubricated exciter blocks. Each exciter block features two flyweights and therefore does not transfer any bending moment to the sidewall of the machine. These exciter blocks can be removed from the machine's sidewall and placed on a work bench in case of a bearing changes. The large contact area between the exciter block flange and the sidewall enables an effective heat transfer from the exciter block. In a way, the sidewall acts as a heatsink. Two stationary three phase standard motors drive the machine through cardan shafts. The exciter blocks are sealed with a triple system; a grease filled labyrinth and two v-rings behind that.



GRID SURFACE

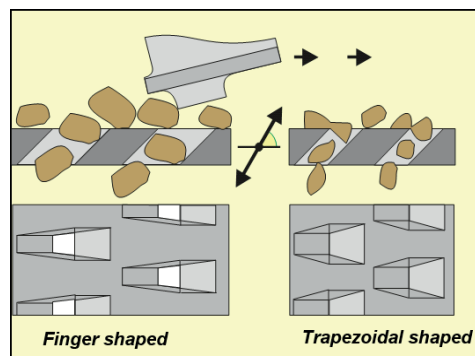
SIZING

- Effective Shake Out widths up to 3.000 mm
- Effective lengths up to 7.600 mm
- The required width of the Shake Out is essentially dependent on the diagonal size of the molding box. The length of the machine is determined by the given sand throughput.
- In molding plants with large molding boxes and long cycle times, a strong pulsation of the sand mass flow naturally occurs. Since the Shake Out needs to be designed for the momentary mass flow and not the average mass flow per hour, it is normal that slow molding plants with large molding boxes also require relatively large Shake Outs



Trapezoidal shaped

Finger shaped



TRAPEZOID SHAPED / FINGER SHAPED

Control Unit

A TWFE Shake Out is always shipped with a switch cabinet, equipped with an S7 PLC Control unit and a Siemens touch panel. The effect of the Shake Out can be significantly modified by adjusting the oscillation angle electronically from the control panel:

Steep oscillation angle:

- large vertical acceleration
- slow conveying speed
- many impulses per stretch of way.

(Ideal for e.g., non-casted moulds and moulds with small castings)

- Flat oscillation angle:
- small vertical acceleration
- fast conveying speed
- few impulses per stretch of way.

(Ideal for e.g., fragile castings)

The oscillation angle can be saved in separate settings which can then be easily be selected at the control panel.



APPLICATIONS

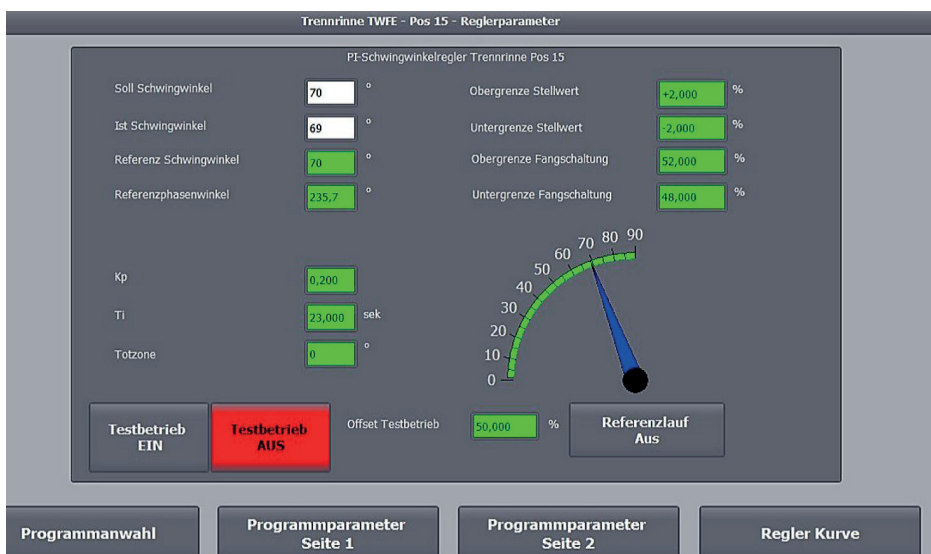
- Green Sand Molding Process

Suspension

The Shake Out is suspended nearly vibration free on a stationary sectional steel frame, using four isolation elements (compression springs or hollow rubber buffers).

Hollow rubber buffers feature a certain material damping that prevents an external excitement of the machine by impulse stresses. This allows distances to other machines (transfer heights) to be reduced when using hollow rubber buffers.

The support structure is usually provided by the client; JOEST delivers an overview drawing with which a local steel construction company can create a production drawing.



USER INTERFACE (SIEMENS TOUCH PANEL)