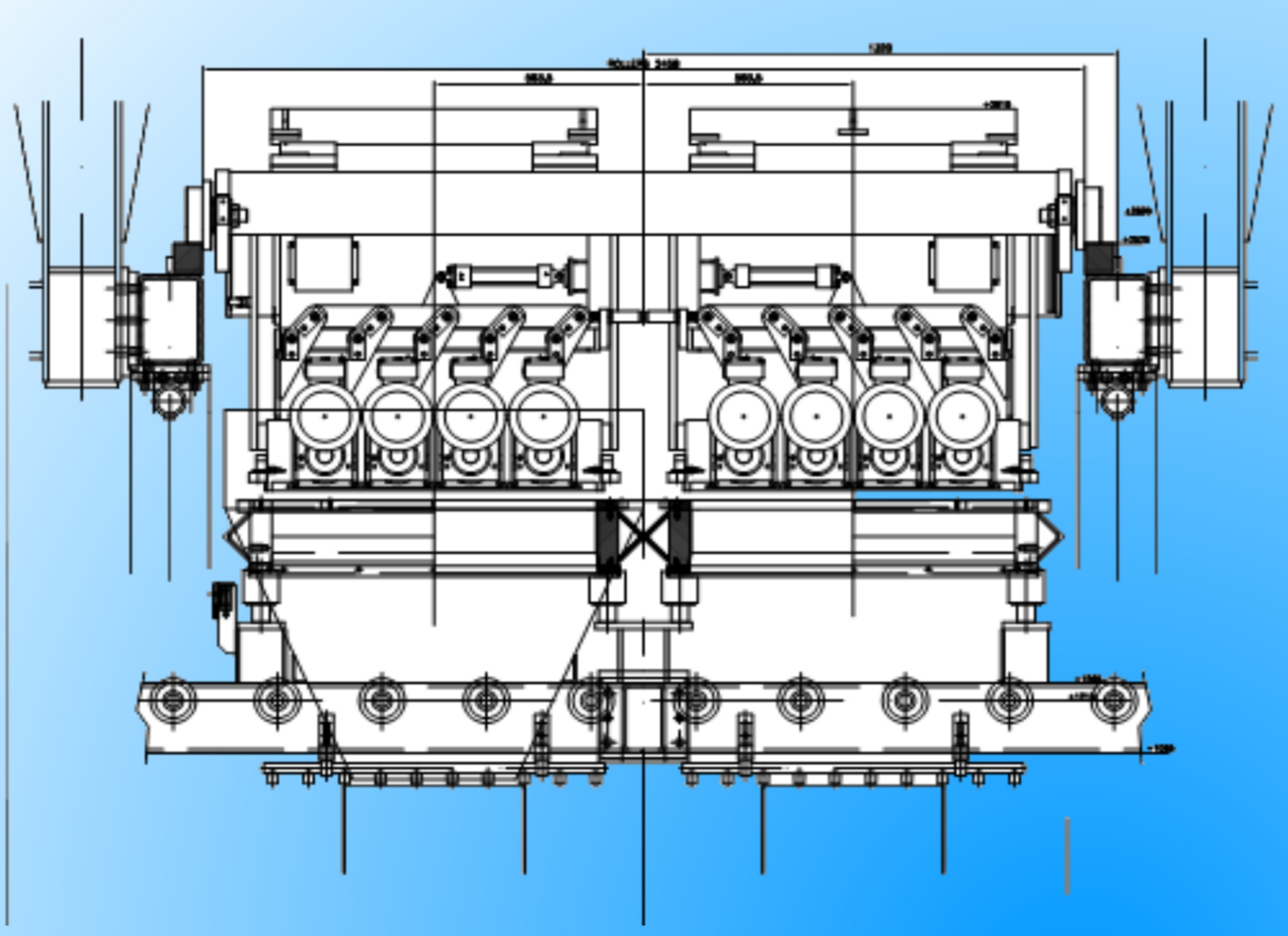
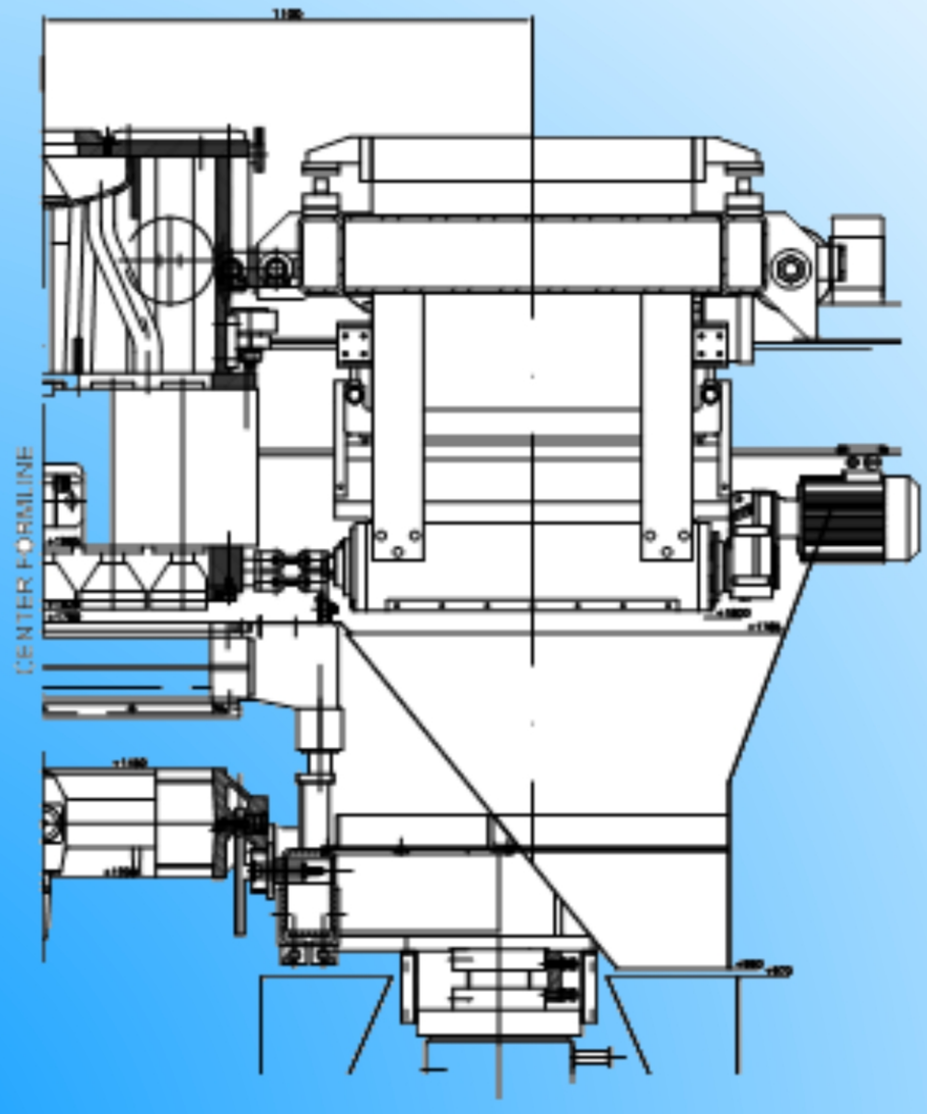
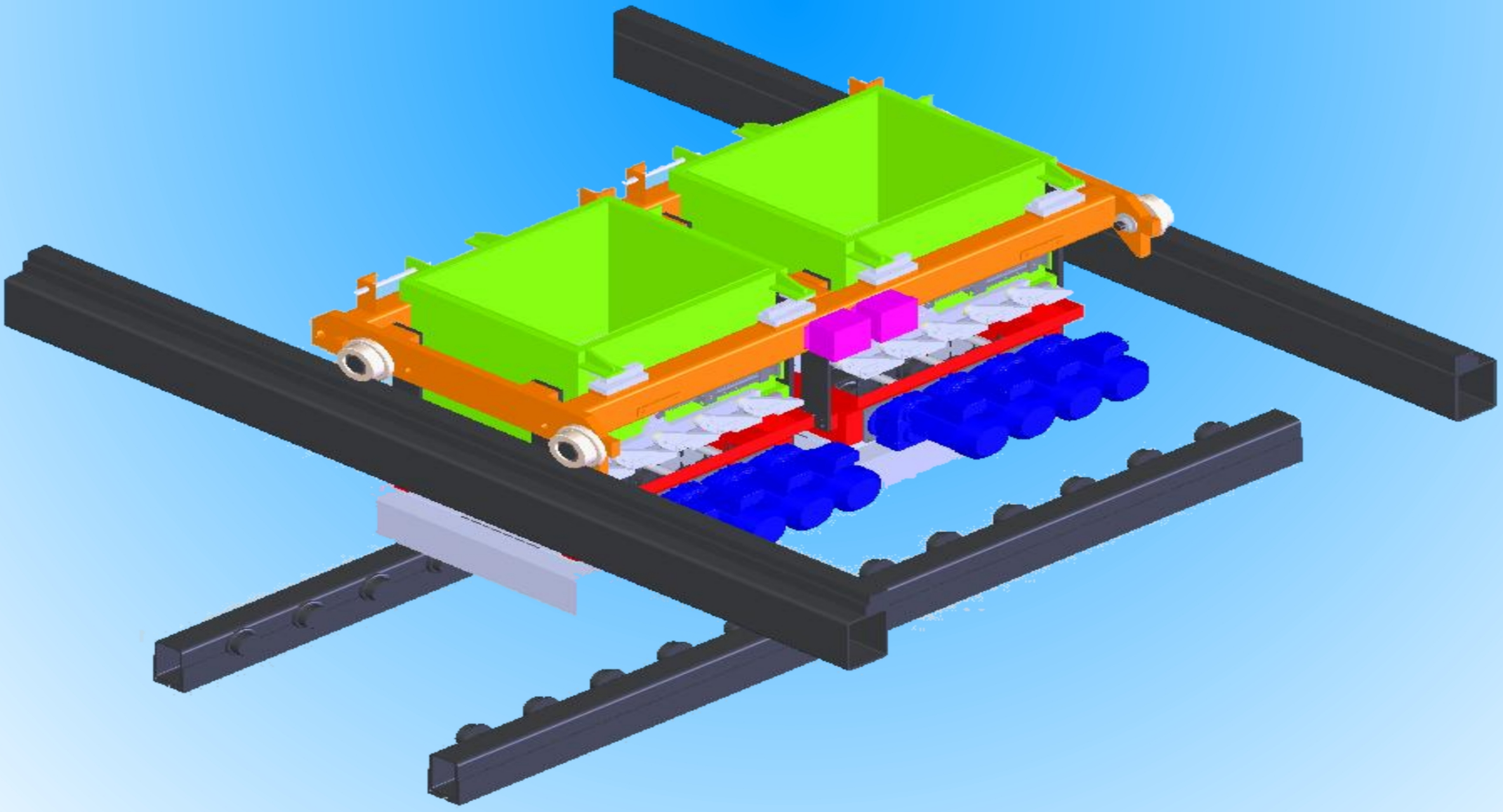
EMPIRE SYSTEMS INC.

INNOVATION FOR INDUSTRY





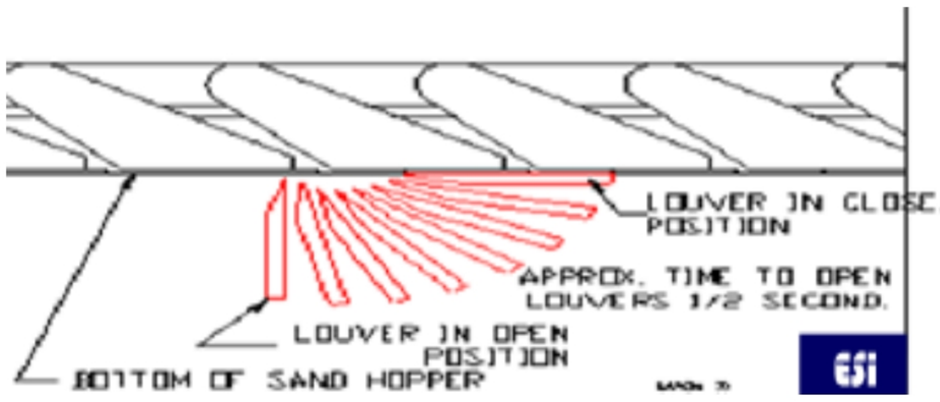


In-Line Fill Aerators

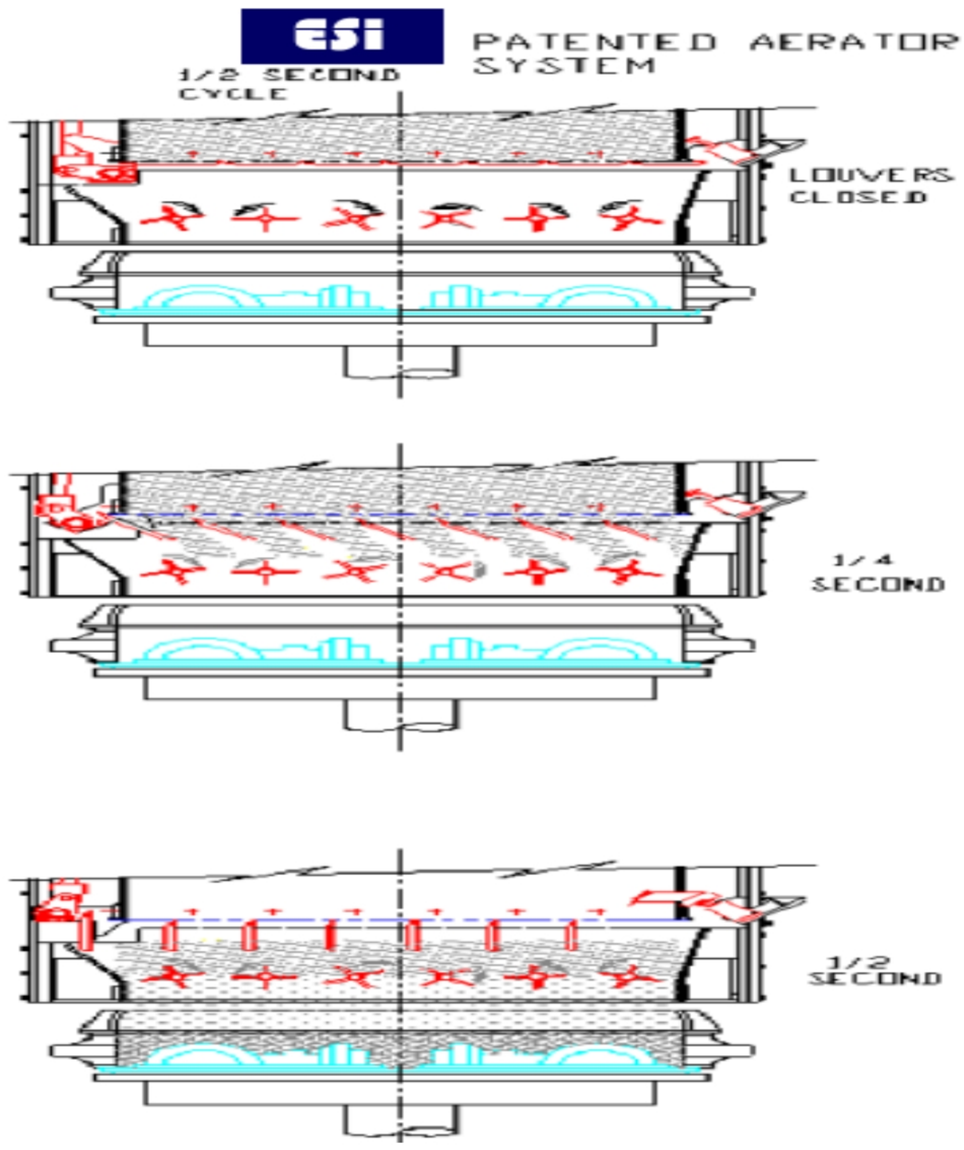
The ability to accurately fill and distribute a uniform density of the aerated lump free sand onto the pattern in all molding processes is essential to superior mold quality.

DESCRIPTION OF OPERATION

The initial step in the ESI Aerator operational sequence consists of discharge of sand from the existing belt conveyor into the Measuring Box. This Measuring Box has a volume equal to the flask and upset frame plus 15%. Once the Measuring Box weighing system indicates the box is filled, the Aerator is shuttled, if required, over the flask. The stainless louver doors are opened via pneumatic cylinders to initiate sand delivery and aeration. The louvers open very rapidly, usually in less than one half second. As the louvers open, they pull away from the bottom of the measuring box. As a result, the sand drops straight down through the Aerator into the flask, filling the mold uniformly. The STAINLESS STEEL lining in the measuring box prevents the sand from sticking in the box. The louvers are then closed and the Measuring Box can be refilled for the next molding cycle. Simultaneously, the Aerator is shuttled out, if required, bringing the squeeze head into position for mold squeeze. Each Aerator spindle shafts is driven by it's own heavy-duty industrial AC gear-motors. Each motor is controlled by it's own frequency inverter drive. This provides a wide speed range for each spindle with full torque. The unique ESI system also provides individual rotation and speed selection capability for each spindle. There is clockwise/counterclockwise and fast/slow speed profile selections for each spindle. These speed and rotation selections make it possible to develop unique flask filling profiles for each pattern. Different filling profiles can be stored in the PLC and recalled when needed. The optimum filling profile for each pattern is established based on results in the field. Sand fill through the aerator is comprised of two functions: first a "riddle" effect on the initial sand that passes through the spindles and is first to contact the pattern surface, then a "sand slinging" effect as the backup sand falls through the aerator spindles. This "sand slinging" effect provides a uniform fill density and actually pre-compacts the sand in the flask. As a result, this system provides a harder mold after squeeze, 3-5 points higher mold hardness across the middle of the mold, and up to 10 points higher in deep pockets and in flask corners.



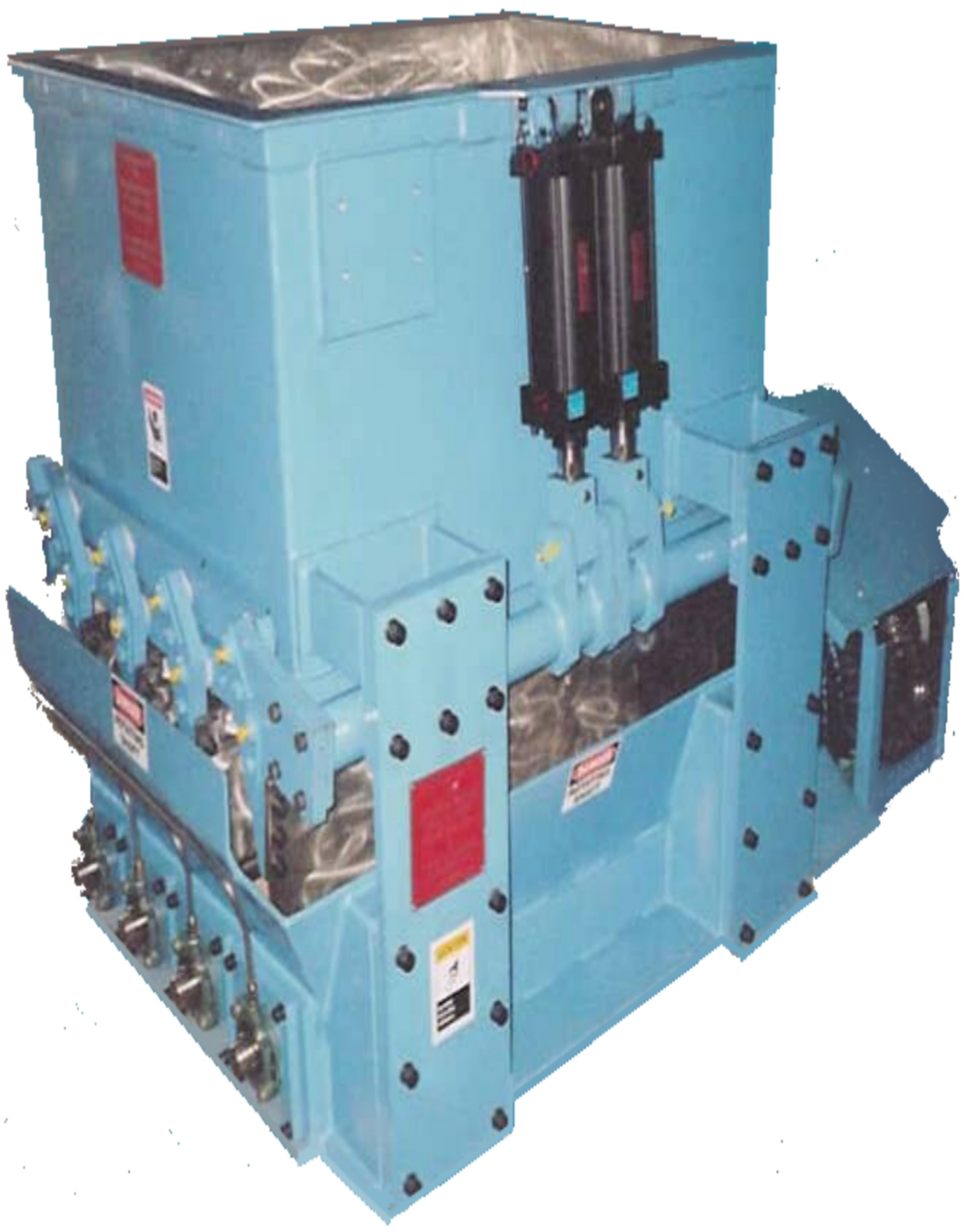
Every pattern has various pockets and or protrusions. By varying the direction and speed of each spindle the sand flow around each spindle shaft can be increased or impeded in relation to each other to provide adjust-ments to control fill of the mold. Variation of the speed and rotation of each aerator spindle can "sling" or "retard" the sand flow. When coordinating the spindle speeds and directions, the mold will achieve a uniform fill level across the entire flask cross section.



Sand is electronically weighed on load cells for each batch and or mold. All the sand for each mold is released in a continuous vertical column to pass thru the spindles. The spindles accelerate or decelerate to control the direction and velocity of the sand while uniformly aerating as it passes from the measuring box thru the aerator onto the pattern and flask. The mold is uniformly filled with the exact amount of sand required. All compaction processes are improved when the density of the materials to be compressed are uniform Fill times and cycle times are less than or equal to current methods Strike off may be eliminated in certain processes. Today's molding technology and as molded casting tolerances make it imperative to produce molds with, uniform mold hardness, superior mold strength, exacting pattern prints. The cost to process sand for molding is a critical factor in the cost per ton equation. Net castings size is directly proportional to molding sand quality.

Benefits provided by the ESI Aerator System®:

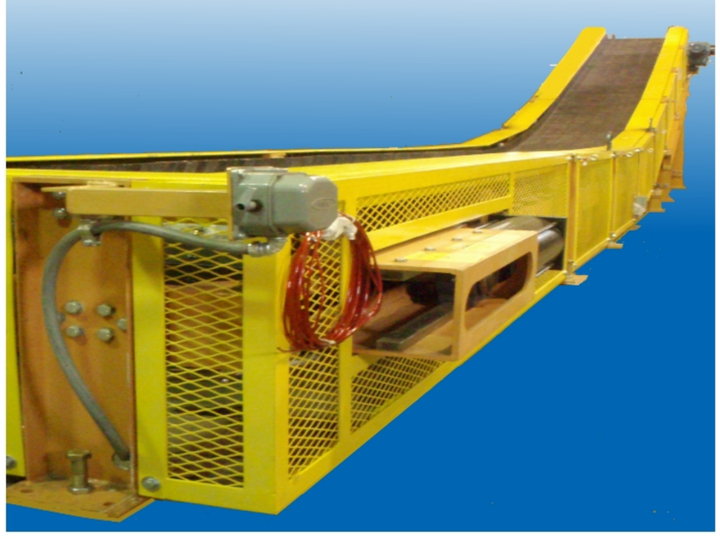
- ❖ **Aeration of the sand at the point of fill to overcome pre-compaction effects in the sand transport system.**
- ❖ **Break up of sand lumps to provide uniform density of the sand delivered to the flask.**
- ❖ **Capability to control fill rate via variation in speed and direction of rotation of the aerator shafts.**
- ❖ **Independent control of speed and direction of each shaft to assist in the direction of sand into hard to fill areas on the pattern or in the flask.**
- ❖ **Reduced sand consumption**
- ❖ **Improved molding characteristics and resulting improved casting finish.**
- ❖ **Faster flask filling cycle can decrease total molding cycle time.**
- ❖ **Reduce burn in caused by loose sand and soft areas of the mold.**



Additional Products & Services

Precision Replacement Components...

For all mulling, molding, and casting handling equipment.



Super-Conveyors...

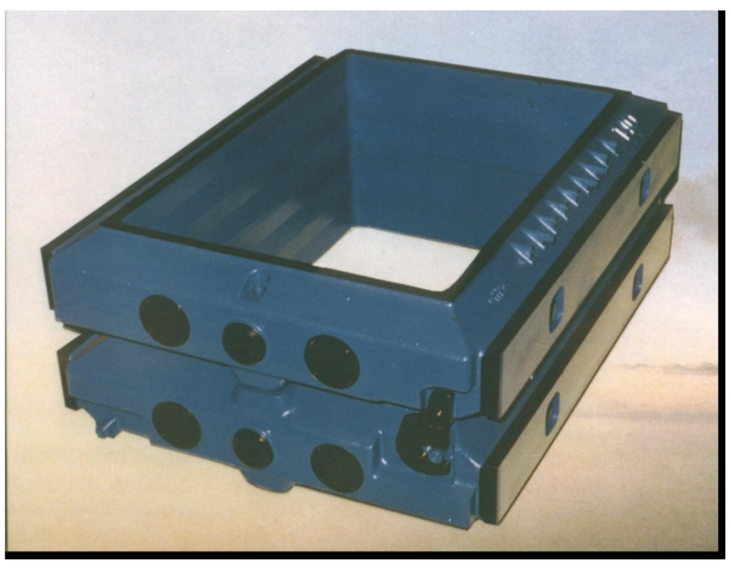
The solution to applications involving the transportation of hot and abrasive materials.

Complete Rebuilds Refurbishment and Upgrades...

Mullors Mixers Sand Coolers

High Pressure Squeeze & Jolt Squeeze Cylinders

Molding Machines Gear Boxes



Flasks...

In quantities of 1 to 1000 for all types of molding systems, jolt squeeze, no-bake, semi-automatic, & high production lines

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