



**WIRTZ**<sup>TM</sup>



*GRAVITY*  
**FLOW** **C A S T E R**

**THE EVOLUTION**  
OF BOOK MOLD CASTING

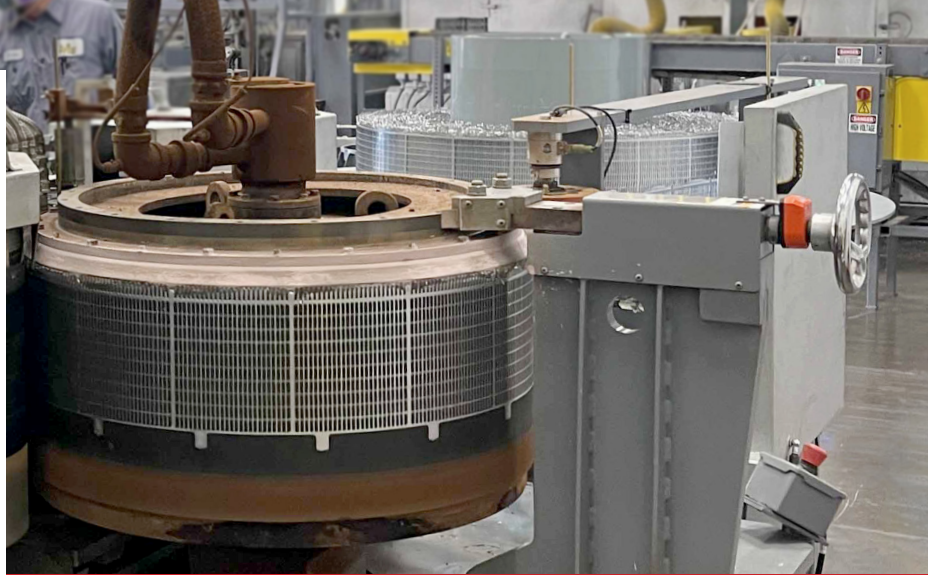
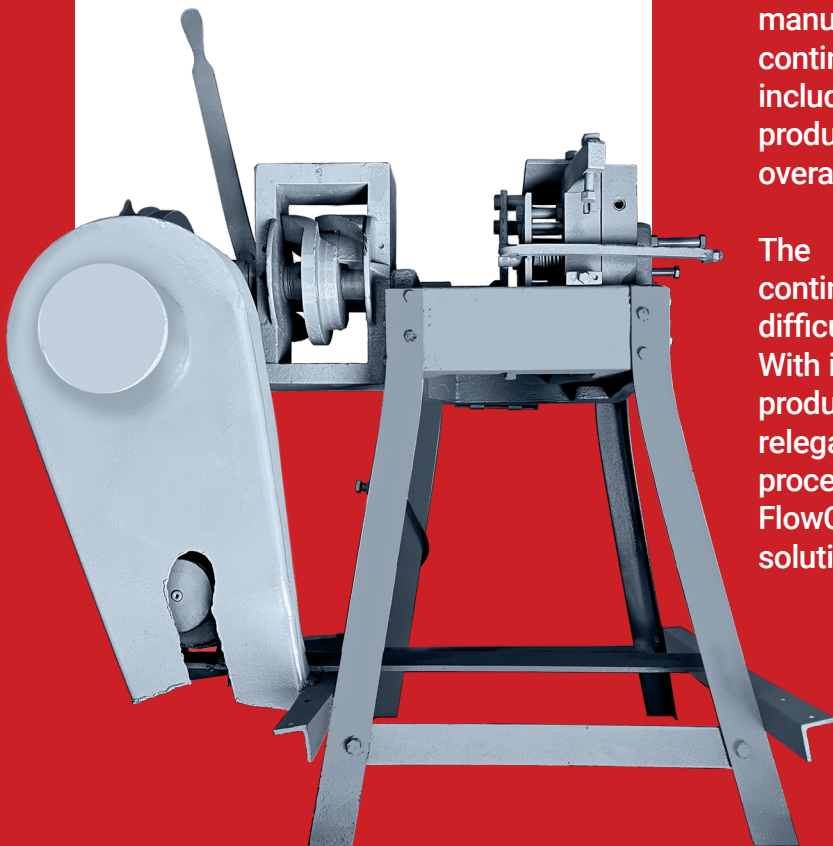
# HISTORY

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As one of the earliest methods of metal fabrication, gravity casting has stood the test of time as being a consistent, reliable, and affordable means of metal and metallic alloy production that serves countless global markets.

Since 1955, Wirtz Manufacturing has been the leading supplier of gravity cast book-mold equipment, tooling, and technology to the lead-acid battery industry. Billions of battery grids, and millions of batteries have been manufactured using Wirtz gravity casting processes, and they have been deployed to serve critical markets from aeronautics to marine vessels, and from emergency power to golf carts.

Wirtz gravity casting technology provides several inherent benefits over other modern grid casting technologies. To name a few: gravity casting allows for excellent grain structure control, it is alloy agnostic, it can accommodate many grid designs and geometries, and it offers excellent paste adhesion properties. For reasons like this, gravity casting technology continues to hold a place in the lead-acid battery market.



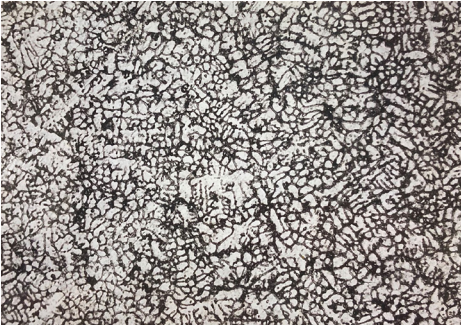
As a world class tooling and specialized capital equipment technology company, Wirtz Manufacturing focuses on continuous improvement and innovation. For this reason, Wirtz has leveraged the benefits of traditional gravity casting and has repackaged the technology into a piece of continuous casting equipment.

While offering the same performance advantage of traditional gravity cast grids, the Gravity FlowCaster delivers a continuous web of grid material in a complete reel-to-reel solution. Like the Wirtz ConCast, each grid is produced with an adjoining frame and is spooled for storage and subsequent downstream processing. With the Gravity FlowCaster, battery manufacturers can now take full advantage of continuous manufacturing, which brings benefits including but not limited to lower scrap rates, higher production speeds, less demanding operations, and overall improved process control.

The Wirtz Gravity FlowCaster is also the first continuous grid casting machine capable of handling difficult-to-process alloys such as lead-antimony. With its alloy segregation and wide freezing window, products requiring antimonial grids have been relegated to piece-by-piece and batch manufacturing processes. Now, with the advent of the Gravity FlowCaster, Wirtz is bringing modern equipment solutions to this product segment.

# GRAIN STRUCTURE

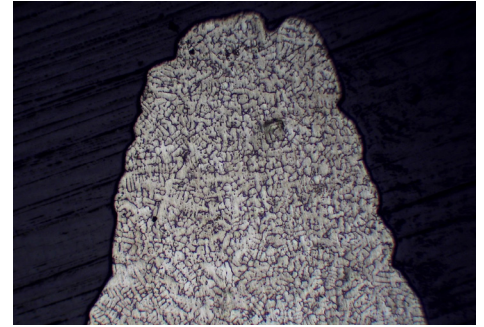
The below micrographs show grain structure for gravity cast antimony alloy grids in column 1, ConCast antimony alloy grids in column 2, and Gravity FlowCaster antimony alloy grids in column 3. Grain size, type, and homogeneity for gravity cast and Gravity FlowCast grids are strikingly similar, whereas the ConCast grids show two very different grain structures across each wire. The micrographs in the top row depict a cross section through the grid wires, while the micrographs in the bottom row show a longitudinal cross section of the grid wires.



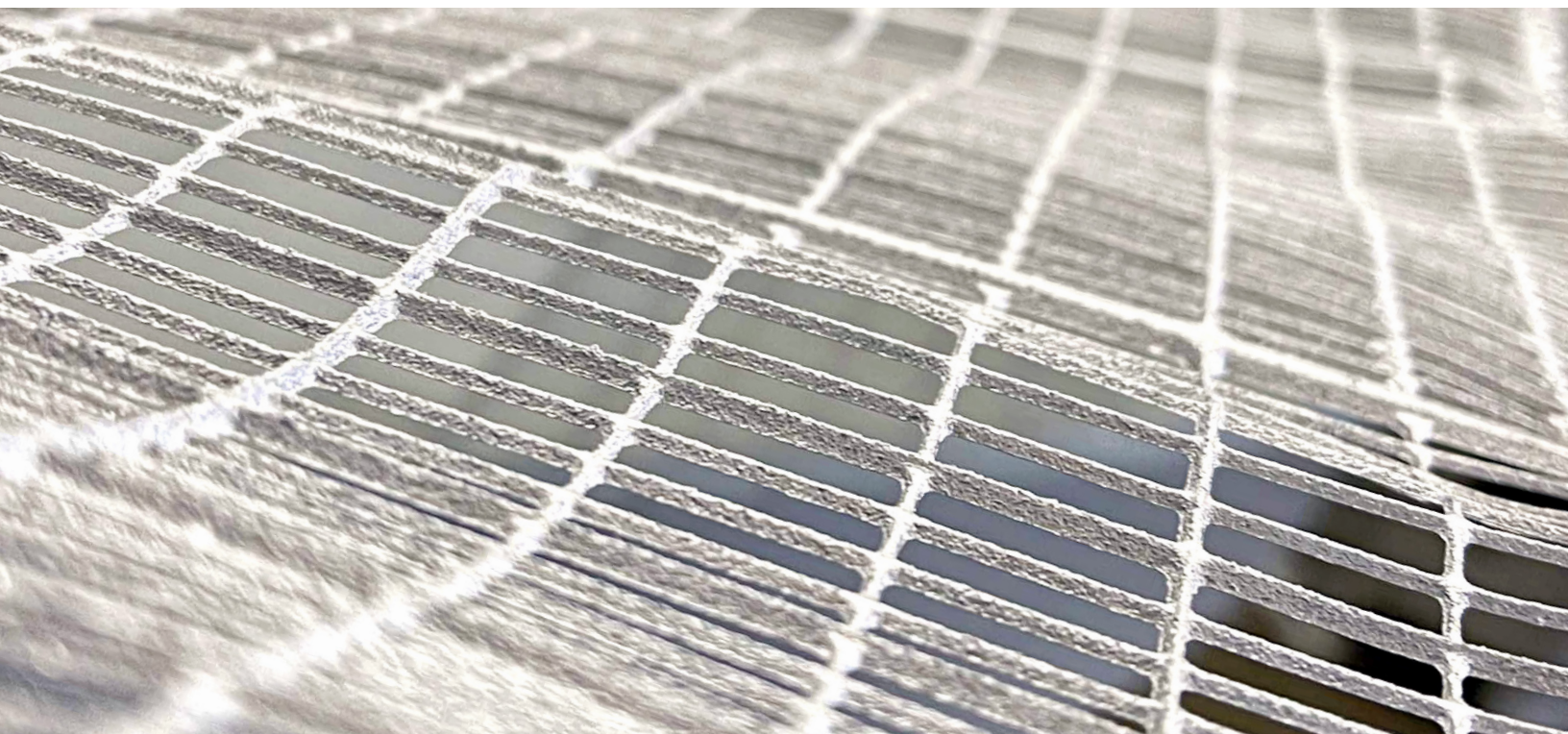
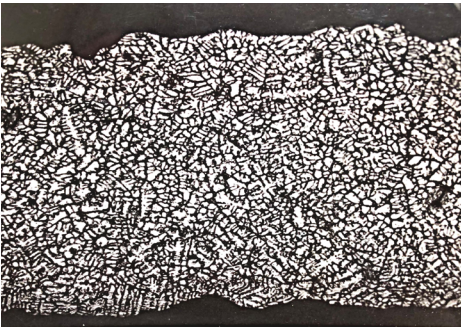
**GRAVITY CAST**



**CONCAST**



**GRAVITY FLOWCAST**



# DESIGN

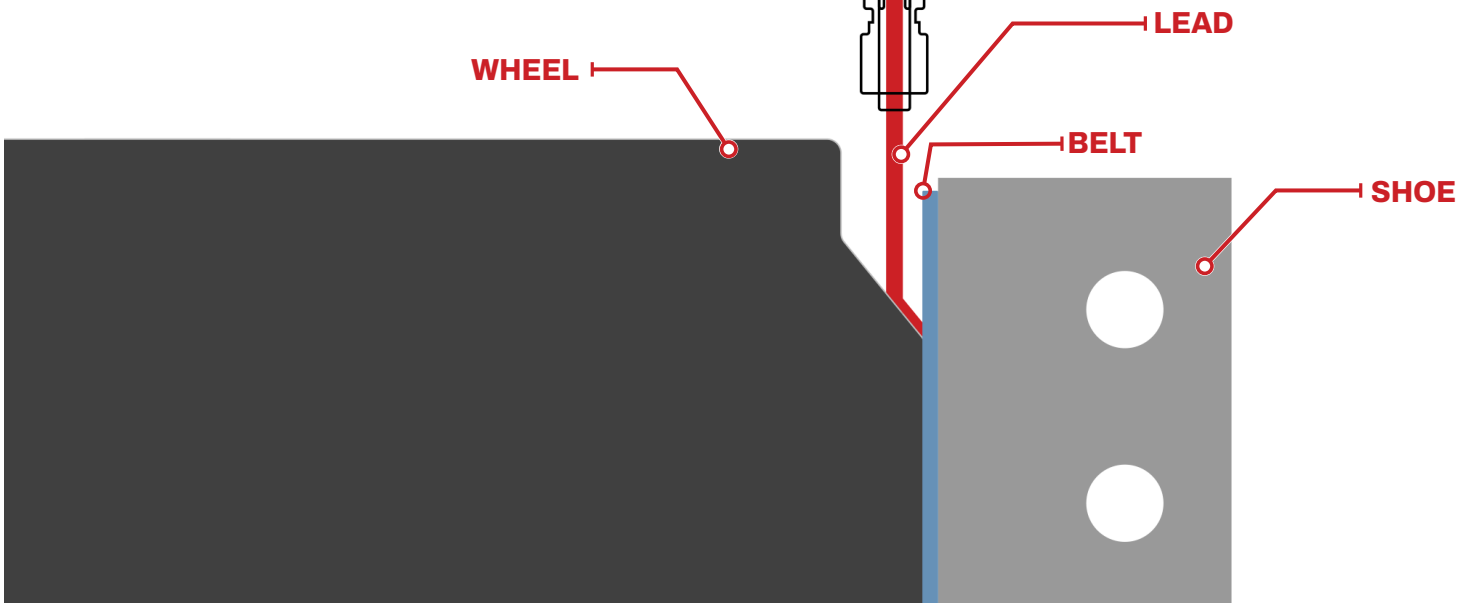
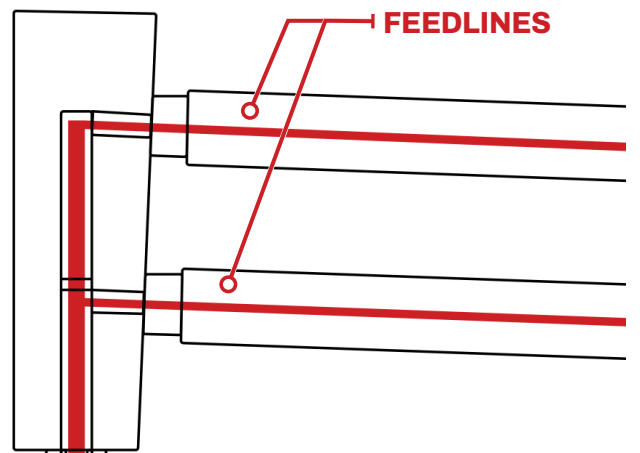
The patented Wirtz Gravity FlowCaster architecture leverages almost a century of mold cavity design and tool engineering know-how to bring the best form and functionality to the customer. The Gravity FlowCaster is based around a continuous rotating mold, whereby half of the mold is comprised of a wheel with an engraved grid cavity and the other half is comprised of a thin steel belt that is forced into engagement with the wheel surface via multiple temperature-controlled shoes.

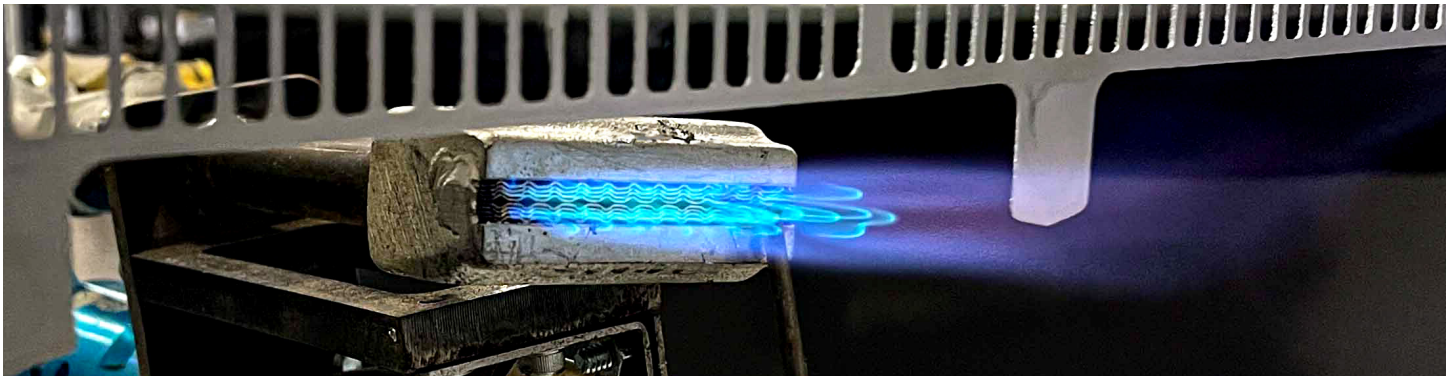
Molten lead or lead alloy is delivered to a gate, or runner system, at the top of the mold. The molten material will then fill the cavity via gravitational force, and it will subsequently solidify while continuing to pass under the temperature-controlled shoes but while still encapsulated between the wheel and belt. With the belt generally moving at the same tangential speed as the wheel, both mold halves will eventually disengage whereby the now solidified web of lead grid may be released from the mold cavity.

Once free from the mold cavity, the interconnected grids can be wound onto a spool with practices similar to that of ConCast.



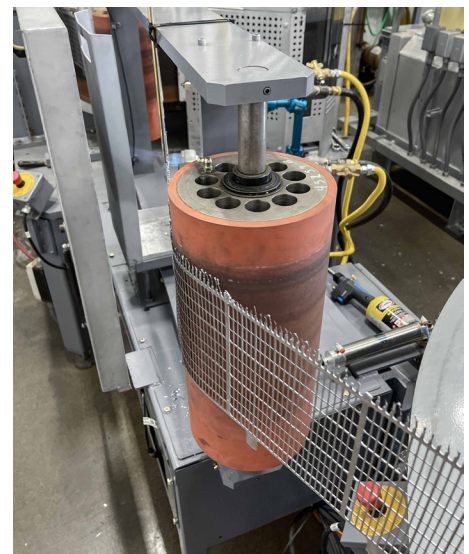
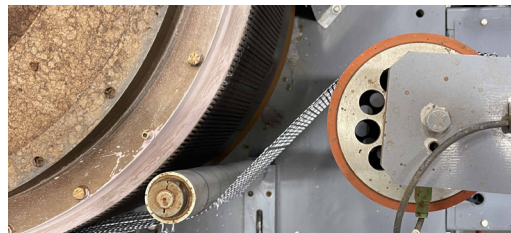
Any flashing present on the grid can be addressed with a standard deflash unit common to the industry. Further, the remaining sprues left at the foot frame of the grid can be trimmed during downstream processing at any time.





| PERFORMANCE / BENEFITS            | GRAVITY<br><b>FLOW</b><br>CASTER | Strip Cast | ConCast | Book Mold |
|-----------------------------------|----------------------------------|------------|---------|-----------|
| ALLOY COMPATIBLE                  | ●●●●●                            | ●●●●○      | ●●●○○   | ●●●●●     |
| GRAIN STRUCTURE                   | ●●●●●                            | ●○○○○      | ●●●○○   | ●●●●●     |
| SCRAP                             | ●●●●○                            | ●○○○○      | ●●●●●   | ●●●○○     |
| FLOOR SPACE                       | ●●●●○                            | ●○○○○      | ●●●○○   | ●●●●●     |
| AUTOMATED<br>CONTINUOUS OPERATION | ●●●●●                            | ●●●●●      | ●●●●●   | ●●○○○     |
| NUMBER OPERATORS<br>REQUIRED      | ●●●●●                            | ●●●○○      | ●●●●●   | ●●●●●     |
| EASE OF OPERATION                 | ●●●●○                            | ●●●○○      | ●●●○○   | ●●○○○     |
| EMISSIONS                         | ●●●●●                            | ●○○○○      | ●●●●●   | ●●●○○     |
| SPEED                             | ●●●○○                            | ●●●●●      | ●●●●●   | ●○○○○     |
| PASTE-ABILITY                     | ●●●●●                            | ●●○○○      | ●●●●○   | ●●●●●     |
| TRAINING REQUIRED                 | ●●●●○                            | ●●●○○      | ●●●○○   | ●●○○○     |
| CAPEX                             | ●●●●○                            | ●○○○○      | ●●●○○   | ●●●●●     |

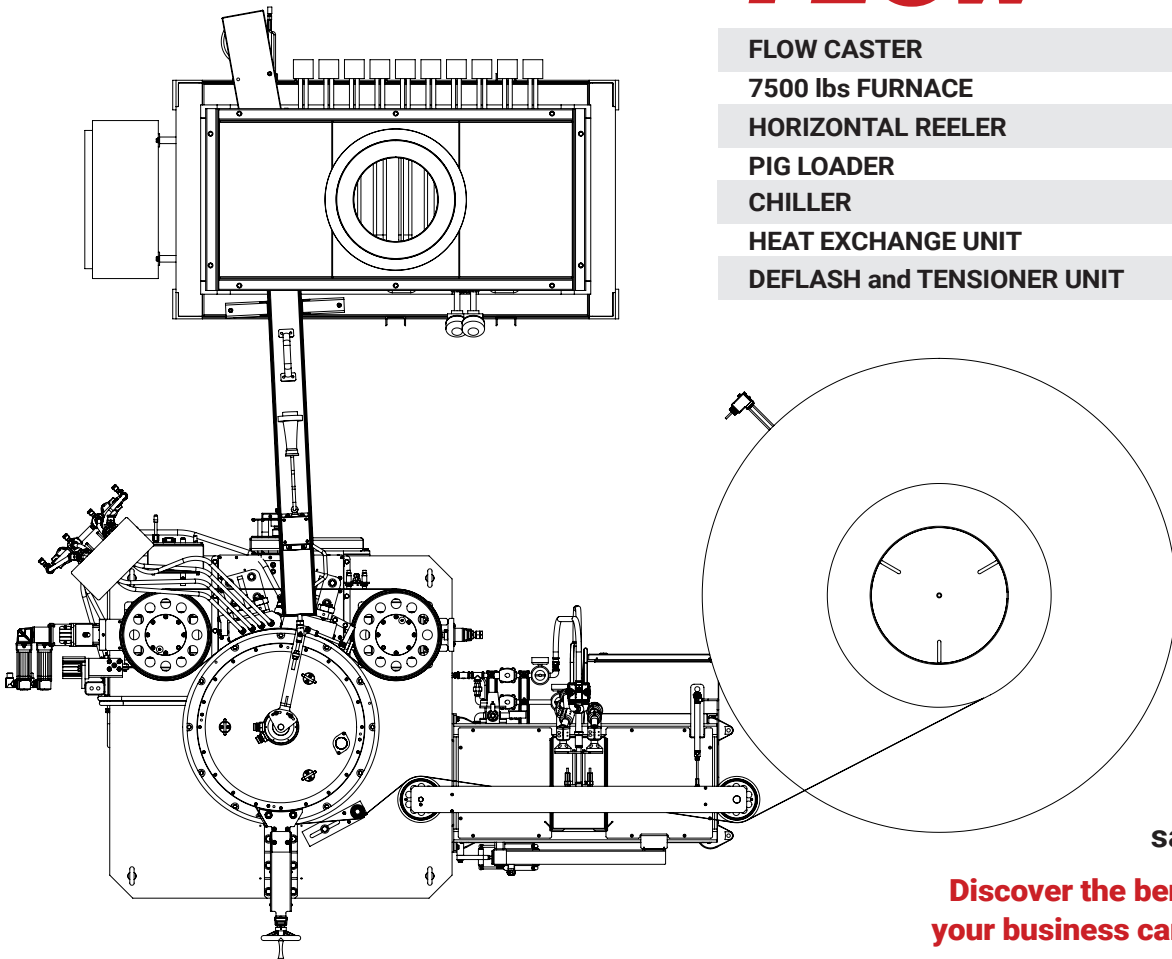
\* RATINGS: ●○○○○=WORST ●●●●●=BEST





**GRAVITY**  
**FLOW** C A S T E R

- FLOW CASTER
- 7500 lbs FURNACE
- HORIZONTAL REELER
- PIG LOADER
- CHILLER
- HEAT EXCHANGE UNIT
- DEFLASH and TENSIONER UNIT



**SMALL  
FOOT PRINT**

LESS THAN  
500 ft<sup>2</sup> FLOOR  
REQUIREMENT

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