innovation taking shape

Shot pot (SPM series) and reciprocating screw (RSM series) extrusion blow molding machines

GRAHAM ENGINEERING CORPORATION
The beverage industry is quite familiar with intermittent extrusion blow molding technology, given that a significant number of reciprocating screw (recip) blow molding machines have been built for lightweight dairy, water, and juice packaging. Since entering this market in 2003, Graham Engineering has dramatically improved traditional recip machine designs and performance, then subsequently developed an even better offshoot technology — the shot pot machine. While Graham’s engineered enhancements are ongoing, the company continues to make significant improvements in cycle time, thereby increasing productivity for our customers. Here are common highlights of what these two remarkable product lines have to offer blow molders:

- 80 ml up to 4 liter applications
- Up to 16 die heads with various clamp sizes
- Specially designed manifold and heads with streamlined flow passages
- Proportionally-controlled hydraulics
- XBM Navigator™ PC control system
- Faster clamp movement and greater clamping forces achieved by special toggle clamp activated by dual proportionally-controlled hydraulic cylinders
- Impact trimming and spin trimming systems
- Pull up and ram down pre-finish
- HDPE, PP, LDPE and other resins can be processed
- Primary usage for lightweight dairy, water, and juice packaging; also useful for household chemical containers, F-style containers, wide mouth jars, and flower pots.
XBM NAVIGATOR™: PC-BASED CONTROLS DEVELOPED BY BLOW MOLDERS FOR BLOW MOLDERS

The efficiency of a production line is closely linked to the accuracy and ease of use of its controls. That is why every Graham blow molding machine uses the XBM Navigator™, a proprietary PC-based system designed by us. The hardware is a standard, 24-volt industrial PC, which eliminates any need for manufacturer-specific components or system expertise. The man-machine interface is a flat panel color display with touch screen capabilities. But the real beauty of the system lies in its Windows® platform operator interface software — it is a package developed by Graham, whose years of blow molding experience ensure that set-ups, trending, analysis, and troubleshooting functions will all be intuitive to the operator.

• All machine control parameters and process variables are easy to call up, check, and adjust
• Optional 100-point parison programming can be added
• Remote diagnostics via either built-in modem or Ethernet connection — enables fast, easy troubleshooting by Graham’s technical support team
• Swing arm mounted operator station allows for improved line-of-sight setup and operation

Proportional hydraulics are standard with the XBM Navigator control system.
Graham’s XBM Navigator™ PC controls utilize intuitive, graphical screens, allowing operators to come up-to-speed quickly. The graphical approach aids in setup and troubleshooting; for example, the color of the heater bands changes to red when heat is applied, and to blue when cooling is applied. Multiple access levels allow different levels of control for operators, technicians, and maintenance personnel. The screens can be switched between dual languages with the touch of a button. Other features include remote diagnostics, trending of key variables, and complete logging of process changes.
Since entering this market in 2003, Graham has taken the traditional reciprocating screw extrusion blow molding technology and incorporated a series of major improvements. We carefully engineered all aspects of our RSM series — hydraulics, manifold, die head, clamps, true quick exhaust, take-away arms, cooling bed design, and four-platen trimmers — in order to develop a production line that will excel in efficiency and low-maintenance performance.

- Ideal for lightweight, single trip dairy, water, juice, and household chemical containers, plus smaller industrial parts
- Graham-designed, oil-filled thrust bearing and ten-groove ball spline are long life and low maintenance

**RSM SERIES RECIPROCATING SCREW MACHINES**

**Die Heads and Manifolds**

- No wear on pressure ring — pressure ring is in its own chamber, so removing the die does not disturb it
- Three or four point die adjustment
- Wider head spacing permits improved mold cooling

- Fixed die head with floating extruder increases perishable tooling life — machine can be set up cold; flow heads and pins are always properly centered
- Balanced manifolds enhance control over parison lengths and start-up speed
- More precise parisons and pressure equalization within the head made possible by eccentric diverter sleeves and extended die head
Clamping • Robust design
• Clamp toggle actuation via either standard Graham cylinder-designed actuation or optional rotary actuator (Rotac)

Air Barrel Cooling • No Hazmat costs associated with liquid cooling media (purchasing, hauling, and disposal)
• Frees up to 10 tons of cooling (compared with liquid barrel cooling) — actual amount depends on extruder size and lbs per hour
• Virtually maintenance-free
• Lower costs for heater band replacement

Compliance and Safety Features • Operator-friendly safety doors with total clamp access just a lever flip away
• ANSI/CE compliant light curtain guarding in front of die head
• CE certification available — all machinery built to comply with CE standards
• Safe machine operation without bulky cage guarding and electrical interlocks — better access overall

Quick Exhaust Air System • Independent pre-blow control allows operators to precisely adjust pre-blow for each head
• As much as 30% faster blow air exhaust for faster cycle times

Dual Pump Hydraulic System • Constant oil filtration and cooling
• Proportional hydraulics standard
• Three or four five-gallon accumulator bottles, tank mounted
• High and low pressure circuits — one pump (low pressure) is for cooling/filtration and one pump (high pressure) is for machine operation

Cooling Beds • Heavy-duty cooling conveyor
• Available in 8 and 12-foot lengths
• Featuring large diameter, heavy-duty push rods, safety step crossovers, and reverse directional operation

Index Trimmers • Four-platen design — extra platen absorbs inertia from a container jam, preventing chain stretch and damage to trim tooling
• Large end sprockets for smoother indexing
• Unique carrier support
• Reverse directional operation
• Roller chain bucket carrier support
• Long-dwell gear box with large cam followers

Swing Arms • Better heat conductivity
• Lighter assembly
• Improved safety
• Smooth operation due to proportional hydraulic control

Optional Container Pick and Place Units • Live roller or pick-and-place bottle transfer from cooling bed to trimmer
• Optional pick-and-place transfer
  - Mechanically transfers containers from cooling bed to trimmer for deflashing
  - Fast, accurate, reliable, and low maintenance for greater efficiencies
  - Uses ball screw technology, electrical drive and control, and vacuum-only air
  - Highly recommended for rectangular, oval, and square containers not on a diagonal parting line

- Containers can be deflashed from one to six per index (dependent on application)
- Available in three models — 24-18, 24-24, and 24-32 (model numbers relate to clearance distance between tie bars for mounting of tooling)
- Spin trimming systems also available
SPM SERIES SHOT POT MACHINES

Not content with the improvement of existing reciprocating screw technology, Graham elected to develop a next generation. SPM Series Shot Pot machines are the direct result. The integration of a shot pot for parison delivery makes shot size independent of the extruder. There are a number of other major advantages over recip models:

- Eliminates ball spline and need for thrust bearing maintenance
- Continuous extrusion for a more homogenous melt and lower stock temperatures
- Ability to add manual or automatic screen changers — material does not travel through the screen pack during parison delivery
- Faster, more stable parison delivery for less shear — 1,000 grams per second is standard; higher drop rates are optional
- Memory of the last extruder flight is removed and with Graham’s head design, parison twisting is practically eliminated
- 8” diameter shot cylinder with center line mounting (standard feature) for shot sizes from 1,200 to 2,000 grams
- With the center line mounted shot cylinder, the breaking of welded feet and cantilevered forces are eliminated
- Extruder sizes include 3.5-inch (90 mm), 4.0-inch (100 mm), and 4.5-inch (115 mm)
- 200 ml to 4 liter container applications
- Various clamp sizes with configurations for 6, 8, 10, or 12 die heads

Graham SPM Shot Pot machines are equipped with all the features mentioned in the preceding RSM Reciprocating Screw machines section.
# A Comparison of Blow Molding Technologies

<table>
<thead>
<tr>
<th>Machine Feature</th>
<th>Graham RSM</th>
<th>Graham SPM</th>
<th>Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil-Filled Thrust Bearing</td>
<td>Yes</td>
<td>N/A</td>
<td>No</td>
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<tr>
<td>10-Groove Ball Spline</td>
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<tr>
<td>Continuous Extrusion</td>
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<td>Yes</td>
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<td>Reciprocating Screw</td>
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<td>Dual Manifolds for Streamlined Flow</td>
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<td>100-Point Parison Programming Option</td>
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<td>Control System Designed Exclusively for Blow Molding</td>
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<td>Separate Pressure Ring Chamber in Heads</td>
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<tr>
<td>Screen Changer Capability</td>
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<td>Proportional Hydraulics</td>
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<tr>
<td>Shot Capacity up to 3,000 Grams</td>
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