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Brown Machine LLC, NPE 2006 News (Booth #S1409):

Brown Machine Leads the Way in Polypropylene Processing Advancements for Thermoforming

Beaverton, MI – Brown Machine LLC announces series of innovations in their equipment and tooling to facilitate improved processing of polypropylene materials. These process-driven innovations have resulted in an integrated fully optimized thermoformer, trim press and tooling system. Since our founding in 1952, Brown has always believed that serving as the leading equipment provider needed to have a “More Than Just The Machine” focus. With dedicated Process Engineering and Tooling Departments, these groups expand the process knowledge that help drive the innovations behind the equipment. This fundamental belief has resulted in equipment and tooling designs that allow processors to produce the highest quality products at optimal speeds with an expanded process window for numerous successful applications.

On the Material . . .

Before a company can begin to design machine or tool requirements, they should first understand the characteristics of the material. When compared to traditional materials such as polystyrene, polypropylene has higher expansion rates, heat requirements, heat retention and shrink rates; and the process window is narrower meaning the better your equipment and tooling, the better your product. Material suppliers continue to innovate the material and this requires staying up to date.

On the Process . . .

Brown Process Engineers have spent hundreds of hours processing polypropylene products through a hands-on approach and have documented specific variables of the process window. Beginning with forming a range of products across a range of materials in our lab environment, running extensive acceptance trials in our facility on equipment and tooling,



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to working considerably with customers on in-plant solutions, Brown Process Engineers have gained a wealth of knowledge to what requirements enhance and expand the process window.

On the Thermoforming Equipment . . .

Starting at the infeed end of the thermoformer, Brown Process Engineers have found to minimize distortion caused by expanding material, sheet that is either directly extruded inline or pre-heated with a Brown pre-heater allows the high expansion rate of polypropylene to expand naturally prior to entering into the pin chain. The sheet is then fed into a special infeed section to maintain heat stability. Auto-V chain rail systems utilize saddle style pin chain with extended side pins to minimize side load on the chains and uneven chain stretch. This system allows the rails to remain parallel to each other until the operator initiates the amount of "V" to a pre-set location.

Ovens and oven control can be critical. Brown provides four and five stop ovens depending on the application. Top oven banks are configured with multiple zone ceramic or quartz heaters for heat profiling. Bottom oven banks are configured with either cal-rad or quartz heaters again with multiple zones. Zones should be arranged to provide control both across the sheet and in index direction.

Precisely guided, rigid, servo-actuated form stations provide exceptional repeatability, therefore eliminating a changing variable. With Brown's patent-pending servo roller screw actuated 3rd motion independent plug assist, the process window is again expanded particularly with deep draw products.

Large volume multiple circuits for vacuum and blow form provide quick response to the forming function. The addition of servo actuators allow the valves to be mounted on the form station heads providing even quicker response. The valve settings are maintained as part of the process recipe within the control system to insure repeatability when tool changes are made.

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To eliminate unsightly chill marks and offer better material distribution, premature lip contact of the cavities is avoided by including Brown's patented vacuum pulse circuit with 3rd motion applications.

Precise lip configurations can be achieved through coining between the top and bottom molds. This feature requires precise control of the top and bottom tool temperatures to insure there is no interference. Brown offers a servo valve water control circuit which maintains the water temperature and provides alarms along with a form station shut down feature if the temperatures deviate beyond pre-set differentials.

Sheet slitting adds control variables for transferring the formed web within the trim press and allows for consistent trimming across the entire shot. The use of edge slitters for the removal of the edges as it leaves the thermoformer eliminates distortion that can cause problems with moving the formed web over the trim press or jamming within the sheet guides. Internal sheet slitters actuated intermittently provides some independent alignment of the products within the web allowing reliable trimming of the outside rows.

With all of these features controlled through a highly responsive and easy to use control system, the Series 4.0 non-proprietary open architecture control system provides repeatability, adjustability and recipe storage to assure consistency.

On the Trim Press Equipment . . .

Trimming of the polypropylene products requires precise guiding of the moving platen and repeatable movements of the feed and ejection systems. All Brown T-Series horizontal trim presses (standard L-Model, LS-Model for Servo Drive Control, and LP & LDP Models for deep draw progressive trim applications) and V-Series vertical trim presses provide superior guiding and repeatability through multiple linear guide bearings. Servo controlled feed systems with adjustable treadle and product specific sheet guides position the products precisely for accurate trim. If ejection is required, a servo ejector controls the accel, speed and decel of the cycle.

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On Tooling . . .

To complete the integrated package, custom designed tooling within an electronic solid model format provides optimum product quality, cycle times, sheet utilization and tool performance. Utilizing years of process data coupled with engineering formulas based on the principles of physics; factors such as material resin specific heat, cycle times, stripping force, clamping force, trim force, etc. are carefully analyzed and applied to the tooling design. Various innovative features include quick change form and trim tool packages, a patented quick change plug assist system, patented external third motion plug actuation, coining designs for precise lip configurations, patent-pending tag slots, progressive pre-punch / perimeter trim tools, along with interface features to product handling systems, etc. Brown tooling designs continue to lead in innovative solutions.

On Lip Rolling Applications . . .

If your product requires lip rolling, the advanced four screw LR-2000S lip roller is equipped to roll quality containers at high speed. Patented features within feed roller and curling screw head, coupled with special oven and heated lip enhancements allows for a larger process window. A host of available adjustments such as operating speed, temperatures, curling screw position, crowd roll position, and feed rate can be made while the unit is in operation. Curling screws are designed based on natural roll and forming characteristics of the material.

Equipment / Tooling Solutions from a Process Perspective

By providing "More Than Just The Machine", Brown not only understands the requirements to process polypropylene. Our Process Engineers have in depth experience with APET, HDPE, PLA, PS, OPS, EPS, TPO, PVC and other materials, as well. This material understanding allows your Brown team to configure the right solution of features and options on the thermoformer, trim press, tooling and lip rollers to meet your specific solution. Ask your Brown Sales Representative what is the right solution for you.

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Brown Machine at NPE 2006

Brown Machine will be exhibiting at NPE 2006 at McCormick Place in Chicago, IL, June 19-23, 2006 at booth #S1409 and can answer your questions regarding polypropylene forming.

On Brown Machine LLC

As a global leader of thermoforming technologies, Brown Machine LLC engineers and builds a complete standard line of continuous and cut-sheet thermoforming equipment and related tooling/peripheral equipment. Specialty thermoforming systems suited to a wide range of markets (including automotive, recreational, packaging, appliance and various other industrial segments) can be custom built to exact customer specifications. Brown Machine fully supports the thermoforming industry (Brown machine owners and competitive models, as well) with a full complement of 24/7/365 on-call service and parts support.

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