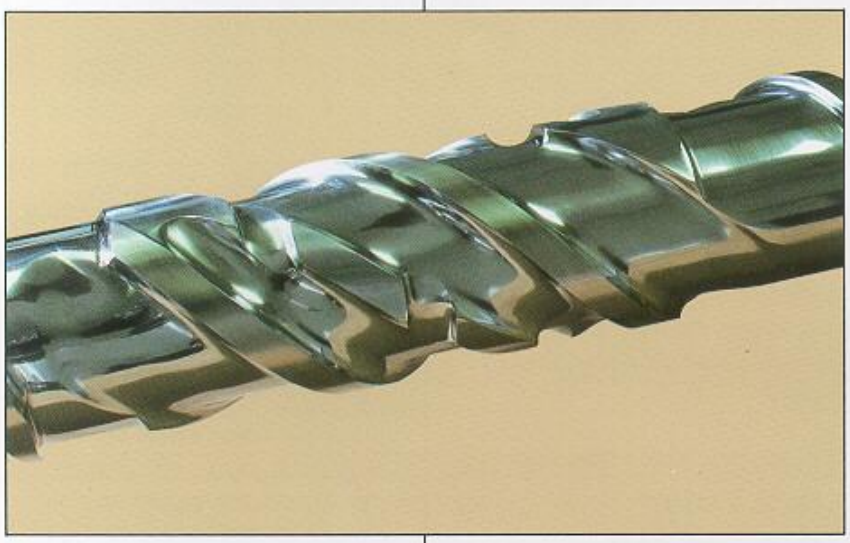
THE EAGLE™ PASSES NEW TESTS



Eagle™ Mixing Screw Outperforms Leading Barrier Screw

The Eagle™ Mixing Screw was introduced to the market in 1991 and now more than 400 Eagles™ are being used in injection, extrusion and blow molding applications. Materials being processed include PP, HDPE, PC, PS, HIPS, ABS, PPO-PPE, SAN, PET, POM, PVC and nylon.

Although several tests have been conducted comparing the Eagle™ to various metering and mixing screws, until recently no tests had been performed under controlled laboratory conditions comparing the Eagle™ with a leading barrier screw. Such a test was completed in the laboratory of a valued customer, utilizing a new injection molding machine equipped with state-of-the-art controls. A spectrophotometer was used to evaluate color mixing using loading levels of pelletized color at 3% and 4%. All performance measurements were automatically recorded using a RJG Dartnet System.

The Test

The test was conducted on a 57mm, 30 ounce injection molding machine, using Amoco 4036 polypropylene (5.5 M.I.) with 4% color concentrate added. The color concentrate from Allied Color was 50% PP and 50% pigment. The part was a serving tray weighing 204.5 grams (7.22 ounces) which represented approximately 27% of the shot capacity of the machine for that material.

Three heat profiles were used with each screw to complete 20 shots in each profile after heats had stabilized. A flat, hump and reverse heat profile was used to determine the optimum for both screws.

Melt temperature was measured using a preheated pyrometer at the end of each test run. Screw recovery (in

Figure 1

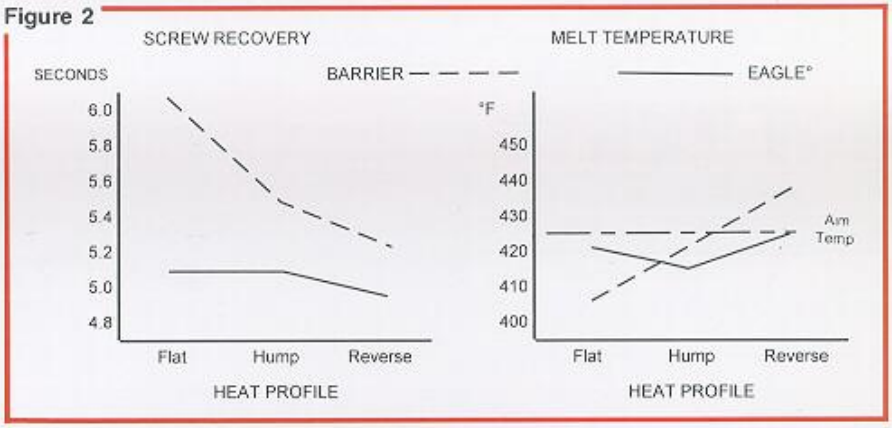
EAGLE™ MIXING SCREW

BARRIER SCREW

seconds) and screw motor hydraulic pressure (PSI) were measured for each shot, while energy consumption (KW) was recorded for each 20-shot run. Part weight for each run was also measured for consistency.

Different screw RPM and back pressure settings were used to optimize the performance of each screw. The tenth shot (part) was selected for testing by the spectrophotometer.

Figure 2



Test Results

The most rapid screw recovery rate for both screws resulted when using a reverse heat profile. The profile settings were 440°F in the rear, 420°F in the transition zone and 400°F in the front zone. This heat profile also resulted in the best performances in the other categories tested, including screw motor drive pressure, energy consumption and color quality. Melt temperatures were moderately higher using this profile, but within an acceptable range. In fact, the melt temperature achieved with the Eagle™ mixing screw was the aim melt temperature.

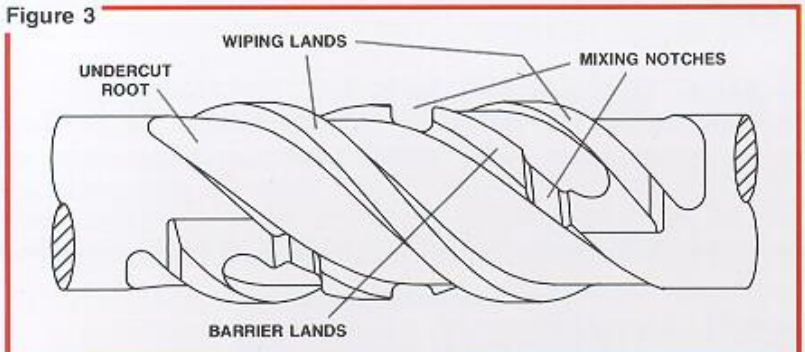
The degree to which the performance of the Eagle™ screw exceeded that of the barrier screw is presented in Figure 2.

Twenty-five Percent Less Color Concentrate

The results in Figure 2 do not include one of the more important test features, color mixing. After running both screws using 4% color concentrate, the loading level of pelletized color was reduced to 3% and tests were repeated.

Although not apparent to the naked eye, the spectrophotometer evaluation indicated that the Eagle™ mixing screw provided a "match" with the 3% loading when compared to the barrier screw at 4%. The ability of the Eagle™ to achieve a desirable color intensity with 25% less color concentrate is a significant factor to anyone processing with color. Although such results may not be achieved in all cases, the test indicates that the Eagle™ is capable of yielding the highest quality of color mixing at the lowest loading of color additive.

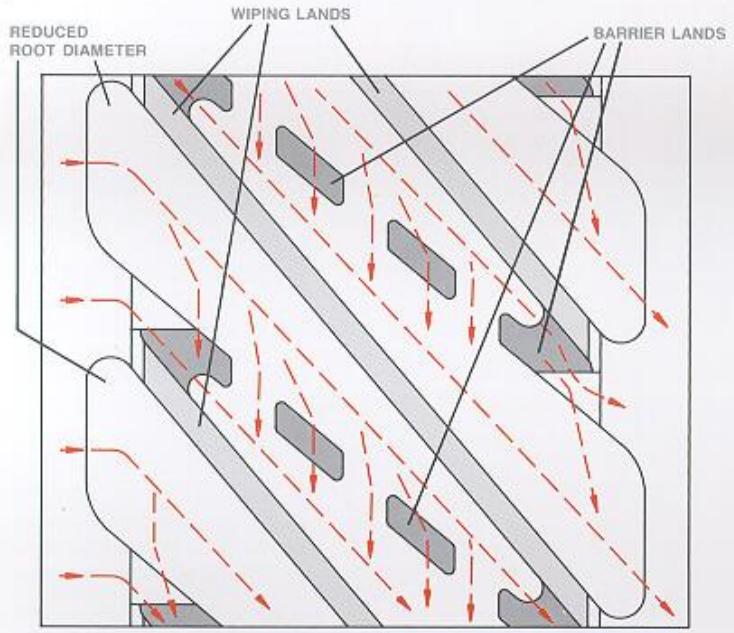
Figure 3



Test Summary

Although the barrier screw performed quite well in all test categories, the Eagle™ mixing screw proved to be superior in recovery time, regardless of the heat profile, back pressure or screw RPM. Likewise, the Eagle™ required less screw motor drive pressure and consumed less electrical energy than the barrier screw. Most important, the Eagle™ mixing screw did what it was designed to do.....mix color!

Figure 4



How It Works

The Eagle™ mixing section (Figure 3) utilizes mixing lands with large helix angles to rapidly convey the melt over barrier lands or through mixing notches (Figure 4), achieving homogenization by altering the direction of flow through the mixer. Because of these design features, the Eagle™ can be run at high speed (250 RPM or more) without degradation or overheating.

Prior Survey

Previous testing of the Eagle™ and testimonials from customers have proven that optimum color dispersion and melt quality could be achieved without sacrificing recovery time or generating high shear heat.

A survey questionaire was sent to 57 different customers involving more than 75 Eagle™ mixing screws. The survey was designed to evaluate seven categories of color mixing, melt quality and plastics processing performance. Replies were received from 65% of those surveyed and a summary of their responses is shown below.

The survey results combined with the laboratory test results prove that the Eagle™ design offers the user significant improvement in all areas of processing. In fact, two-thirds of the customers surveyed reported improved screw recovery while achieving optimum color mixing and melt quality. It works!

Figure 5

CATEGORY	Percent of Responses Reporting Improvement
COLOR MIXING - ability to perform distributive mixing of color additives to achieve uniform part appearance	90.9%
MELT QUALITY - provides dispersive mixing to assure complete melting of the resin, achieving uniform viscosity without agglomerates or gels	86.5%
SCREW RECOVERY - time required to melt resin during screw recovery cycle	65.6%
CYCLE TIME - elapsed time between one point in molding cycle to the same point in the next cycle	60.0%
MELT TEMPERATURE - achieving an isothermal melt of the resin at the lowest possible temperature without thermal degradation or heat override	69.4%
EASE OF COLOR CHANGE - relates to the amount of time and material required to change from one color to another	44.4%
EASE OF PROCESSING - the degree of latitude available in altering processing parameters while still producing quality parts, ie. the "processing window"	86.5%

Westland Services To Processors

Westland Corporation offers a complete line of machinery components and services to injection molders, blow molders and extruders. These capabilities include:

- **Full-Length relining of barrels** up to 135 inches in length using premium tool steels and special alloys, depending upon the customer's need.
- **New Barrels** lined with these same steels and alloys or standard and premium bi-metallic alloys.
- **Custom-Designed Screws** that match the resins being processed to enhance melt quality, minimize cycle times and improve reject rates.
- **Mixing Screws and Barrier Screws** to insure good color mixing and melt homogeneity without incurring excessive shear heat. The designs offered include our patented new "Eagle™" design.
- **Screw Rebuilding** during which worn screws are ground, the flight hard-surfacing restored, plated (or nitrided) and polished to a like-new condition.
- **Injection Unit Downsizing** to help correct long residence times and provide for more efficient processing of smaller parts.
- **Injection Unit Upsizing** to provide greater shot capacity and part production where barrel configuration and machine hydraulics permit.
- **Marbleizing Conversions** which include a special screw, valve, torpedo and end cap to achieve a marble-like part appearance.
- **End Caps and Valves** for IMM's, including free-flow ring valves, ball check valves and special four-piece valves, all made from special tool steels.

About Westland

Westland Corporation is a manufacturer and rebuilder of barrels and screws for injection molding machines, blow molding machines and extruders. The Company operates from one 27,000 square foot facility located in Wichita, Kansas. Formerly known as CAC Tool Corporation, Westland is the acknowledged industry leader in the manufacture and rebuilding of barrels using tool steel and special alloys as lining materials.

Most recently Westland has gained recognition as a designer and manufacturer of screws offering custom and special designed screws, including barrier designs and the remarkable new patented Eagle™ mixing screw.

An active member of the Machinery Division of S.P.I., Westland has become well-known in the industry as an innovative leader in barrel and screw technology. In the most recent Market Research Study conducted by Plastics Technology, Westland ranked among the top three as a recognized supplier of both barrels and screws.

Westland Corporation™

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