

# Sole mates

Based on tests of a high molecular weight PVC, a manufacturer predicts that it has a step up on the competition.

By John DeGaspari, Associate Editor

ONE OF THE HARSHTEST environments confronting industrial apparel takes place where boots hit the floor of chemical and food processing plants. LaCrosse Rainfair of Racine, Wis., a manufacturer of footwear and clothing, developed a dual-density outer sole that combines toughness and elasticity with resistance to chemicals, fats, and oils.

The company fuses the outer sole directly to the soft upper sole of its Flex3 boot in a two-stage process.

First, it overmolds the sole of the upper with an orange-colored Flexalloy OR vinyl/elastomer blend, which is supplied by Teknor Apex of Pawtucket, R.I., to cushion the foot and provide gripping action to prevent slipping. A second overmolding step fuses the harder gray compound around the exterior of the orange segment. Not completely covered by the harder gray portion of the outer sole, the softer orange segment contacts the floor, providing cushioning and stability.

## NO NEED FOR ADHESIVES

According to Mike Quill, senior marketing manager of LaCrosse Rainfair, the Flexalloy compound has very good oil resistance compared with other materials used in other injection molded outer soles.

"This property is doubly valuable in the Flex3 boot since, by overmolding the outsole directly on the upper, we eliminate the need for adhesives, which could degrade under aggressive attack and cause total product failure," Quill said.

He said that the company used many different specialty vinyl compounds in its premium priced rubber boots that outperform standard vinyl formulations. Recently, it employed compounds that are based on ultrahigh molecular weight polyvinyl chloride polymer, which is stronger, more abrasion-resistant, and more elastic than compounds made of conventional polyvinyl chloride.



The outer sole of the Flex 3 boot (left) uses a two-step overmolding process to fuse the orange vinyl/elastomer blend (top right) and the harder gray compound (lower right).

When LaCrosse Rainfair subjected the boots made from Flexalloy OR to prolonged exposure to animal fats, the boots were free of the stiffening and cracking exhibited by boots produced from conventional vinyl formulations, according to Quill.

John Macaluso, industry manager of Teknor Apex, cited test results of Flexalloy OR compounds versus conventional materials after three days of immersion at a temperature of 125°C in aggressive fluids. Samples of Flexalloy OR compound immersed in ASTM No. 3 oil swelled 0.9 percent, compared with 15 percent swelling of a styrenic (SEBS), 4.1 percent shrinkage of flexible vinyl, and disintegration of a thermoplastic olefin elastomer.

In the same test, Flexalloy OR-based samples retain 74 percent of their original elongation, a property that correlates with elasticity, versus just 1 percent for flexible vinyl.

When it is immersed in lard, the Flexalloy OR-based sample shrank 5 percent, compared with 6 percent and 84 percent swelling of the SEBS styrenic and thermoplastic olefin, respectively, and 13 percent shrinkage of the flexible vinyl. The Flexalloy OR compounds retained 84 percent of their elongation, compared with 58 percent for the flexible vinyl. ■