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Metal stamping gets quality boost

Pressurex is a thin flexible Mylar-based sensor film that instantly captures and permanently records pressure distribution and magnitude between any two mating or contacting surfaces. By pinpointing important pressure points that affect tool balancing and key pressure areas that lead to die wear, the film can be used to reduce long term production maintenance costs and improve part quality.

Mirco Graenert, Mirco Graenert Consulting Inc. (www.canstampconsulting.com) of Newmarket, ON, and Shawn Eeles, general manager of Five Star Tooling, a progressive die manufacturer in Aurora, ON, put Pressurex through a 400-ton progressive die trial to analyze its capabilities. Testing proved that Pressurex can reveal pressures accurately in die forming and piercing operations. Graenert and Eeles who have thousands of hours of metal stamping experience were able to identify pressure points affecting tool balancing

and long term die maintenance costs.

Significant effort goes into the design and balancing of the components in a stamping tool; verifiable data can only be obtained in a press, ideally near completion of the die build phase.

The test setup that was used to obtain accurate pressure readings from within the die was a medium size stamping tool which manufactures parts from a coil of steel. The die is about 1.5 m in length, manufacturing an arched structural car component running material in excess of 2 mm in thickness. The part runs progressively - the material strip is fed through the die in equal spacings (progression distance) between each 400 ton press stroke. At strategic locations within this process, the sensor film (pink strip above) is applied between mating cutting and forming components as well as bumper blocks, revealing local pressures which can be modified to optimize the balancing of the die.

"Stamping tool designers, tool-makers and engineers know that it is vital to balance the

Cover Story

Pressure-indicating film cuts setup time and production maintenance

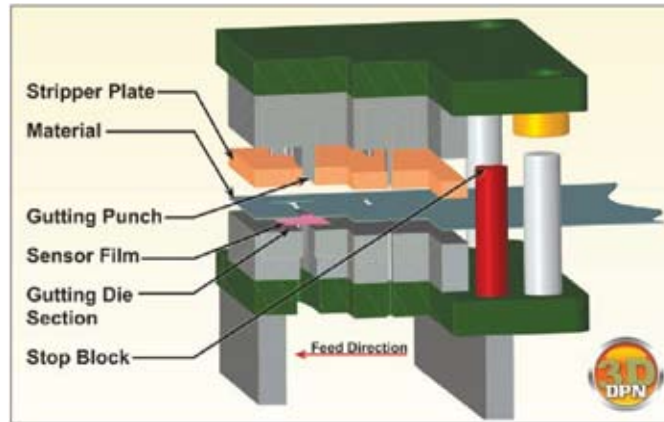
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overall processes of metal cuts and strikes which are required to shape a part progressively in a die," said Graenert, "accurately balancing by obtaining pressure readings from the various operations results in higher quality dies and lower future die maintenance costs."

The initial die build and balancing are vital for positive long term effects. The re-strike station, particularly on thicker or formed materials, often exerts a concentrated force near the exit side of the die. Unbalanced pressures can cause the

die to "kick," causing premature fatigue, excess wear, and subsequent cracking or breakage of die components. Optimal balance throughout the die is achieved by paying close attention to pressure readings from the film and making adjustments in the gutting station area, usually by varying the stripper pressures when balancing infeed to output die ends.

In their testing, Graenert and Eeles used Pressurex film to analyze the pressure on and around the cutting edges of a progressive die assembly (right). Compressive forces act on the microcapsules of the sensor film just before cutting through



the strip and film. This pressure causes the sensor film's microcapsules to burst, producing an instantaneous and permanent high resolution "topographical" image of pressure variation across the contact area.

Pressurex (in pink) is placed in the progressive die between the material strip and the lower gutting section to determine punch and stripper pressures.

Pressurex, similar in thickness to ordinary paper, changes color directly proportional to the amount of pressure applied and accurately reveals whether pressures are evenly distributed. Precise pressure distribution is determined by comparing the exposed sensor film to a color calibration reference chart.

Pressurex can be further analyzed using Sensor Product's in-house imaging service or by leasing or purchasing its Topaq Tactile Force Analysis System.

The film showed the areas which were doing most of the work in this die station and provided valuable pressure data.

The film allowed them to observe the precise pressure distribution and actual pressure values in the die and take action to correct imbalances or excessive pressures before die-build completion. The cutting edges in the gutting operation compared to the re-strike forms showed similar pressures and were adjusted.

They also analyzed the dies' outer four bumper blocks, the principal indicators of die parallelism. The film revealed detailed data about differences in pressures across the small sections of bumper block, unlike traditional lead check "distance only" measurements.

"The test proved that bumper blocks, areas near cutting edges, gradual forms, trim cutting edges, and re-strike stations can all be thoroughly analyzed, giving vital information that enables better die balancing. Even many heavier (>2 mm) automotive and other stamping and value-added assembly applications are measurable" said Graenert.

"SPI's Pressurex is simple to use and analyze," said Eeles. "It is inexpensive and provides significantly more data than other analysis methods."

"For some dies, these pressure values, particularly combined with die knowledge, reveal what is 'unseen' and allow dies and other mechanical systems to be fine-tuned. This reduces their life cycle maintenance cost and improves part quality and consistency. There are virtually no limits to what this film can reveal in metal stamping," concluded Graenert.

Pressurex reveals surface pressure from 0.14 to 3000 kg/cm² and is available in eight distinct pressure ranges. The film measures tactile pressure magnitude and distribution in applications such as clamps, bolted joints, presses, gaskets, fuel cells, molds, brakes, valves and heat seals. This article was contributed by Sensor Products Inc.

www.sensorprod.com