



Metal Forming Success Story

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Surface Enhancement
Performance Leader

Pentaflex, Inc. Gets Maximum Production, Minimum Downtime With Phygen's FortiPhy™ Coating

The Bottom Line

Pentaflex, Incorporated, a stamper producing heavy duty components for the tractor and trailer industry, began experiencing problems with galling, lost production and downtime in their drawing applications. Pentaflex turned to FortiPhy™ coating from Phygen, Inc. and now runs continuously with reduced downtime and repairs, saving \$14,000 to \$20,000 annually.

The Numbers

Part rework and/or sort TD and other coatings: 900 parts maximum

With FortiPhy coating: 37,000 parts

Pentaflex, Incorporated, Springfield, OH, is a medium to heavy gauge stamper. Their press room capacity ranges from 2,300 tons down to 75 tons and includes both hydraulic and mechanical presses. Pentaflex produces heavy duty components for the tractor and trailer industry including close tolerance brake systems. Materials they work with usually are high-strength, low-alloy steels ranging in thickness from 0.100" to 0.500". "About 40 percent of our work is drawing applications," observes Michael Stull, Tooling Manager at Pentaflex. "The balance consists of blanking and forming operations.

Galling Was a Major Problem

"We're drawing brake drums out of 1010 - 1018 high-strength, low-alloy steel that's roughly .312" thick. "Initially we were experiencing a lot of galling because we actually have to iron the part during the drawing operation," Stull explains. "The ID tolerance on this 12" diameter, 5.500" deep drawn part is ± 0.005 ". In addition a CPK of 1.67 is required throughout the 5.500" depth. "During normal drawing operations the flow of material causes thinning and thickening in some areas and, therefore, leads to the development

of tooling geometry changes in order to hold our tolerances," Stull continues. "Measurements are taken at five different points inside the drum."



"Before we had Phygen, Inc., apply their FortiPhy™ Physical Vapor Deposition (PVD) coating to key tooling surfaces, we were getting severe limitations on productivity because we could not allow any surface imperfections on the ID or the OD of this part," Stull says. FortiPhy™ Chromium Nitride Coating, Phygen's patented system and process for PVD coating, allows the deposition of extremely tough and hard coatings with higher abrasive wear resistance than conventional PVD processes. The technology, based on principles of Plasma Acceleration, provides a unique combination of coating properties by creating a thin and dense, non-columnar coating structure that can be adhered to a variety of substrate materials.

"One of the problems with prior tool coatings was galling. We tried a thermal diffusion coating as well as titanium nitriding and several other types of coatings. But we never were able to get more than 900 parts without having to pull the tooling and perform a complete re-polish." According to Stull, this



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required at least four hours of downtime.

"In addition," Stull continues, "with the former coatings, these tools were designed with an internal forming sleeve. The cost of development of that sleeve itself was roughly \$2,800. The coating was about another \$1,300, so we ended up with a cost of about \$4,000 per sleeve. After a period of running and polishing we would get damage to the sleeves and had to scrap them out."



FortiPhy™ Delivered Many Improvements

After using the FortiPhy™ coating from Phygen, Pentaflex discovered they were able to run continuously. "If we do get any type of pickup, it usually polishes right out with 3 micron paper," Stull says. "We've really had no problems and no damage to the tooling. As far as costs go, they are pretty much even across the board for both the sleeves and the coatings. But, as far as production is concerned, the reduction of downtime, and the expense to repair tooling, on average, our cost savings is at least \$14,000 to \$20,000 per year. At the present time, we have produced 37,300 parts from our dies with the Phygen coating without a major polishing downtime incident.

Other Applications, Benefits

"Concerning other uses for FortiPhy™ coating," Stull says, "we have some thicker parts that are now produced on a 1,500-ton press with a transfer system at 23 strokes (SPM) and before were running them at four strokes per minute in a hydraulic press. Some of the issues we discovered by virtue of increasing forming speed was getting premature buildup on the form tools. As a result, we switched over to the Phygen coating and have completely eliminated our problem."

The Pentaflex tooling department consists of 14 employees engaged in all facets of tool building including the design, building and repair. The FortiPhy™ coating has eliminated a significant amount of tooling repair and labor costs.

Final Thoughts on Phygen/FortiPhy™

"At this time, we are heading toward using FortiPhy™ for all our coating needs," Stull observes. "We have seen improvement across the board. There are a lot of cases where we have been using chrome plating on some of the lower run jobs because we didn't feel that FortiPhy™ was required. But we're finding out now that by using the FortiPhy™ coating for these jobs, we're eliminating the chipping and flaking that we get over a period of time with the chrome and eliminate small costs that can add up to big increases in available toolmaker time."

"I feel very confident that the people at Phygen really know their business," Mike says. "Any time we discuss difficult applications, they always seem to know exactly what part of the tooling to concentrate on. Afterward, they call me back asking how these details are working out. If our success is not quite up to what we were looking for, they make recommendations on tool steels, heat treatment, finishes, and other things to help us get through our problems."

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