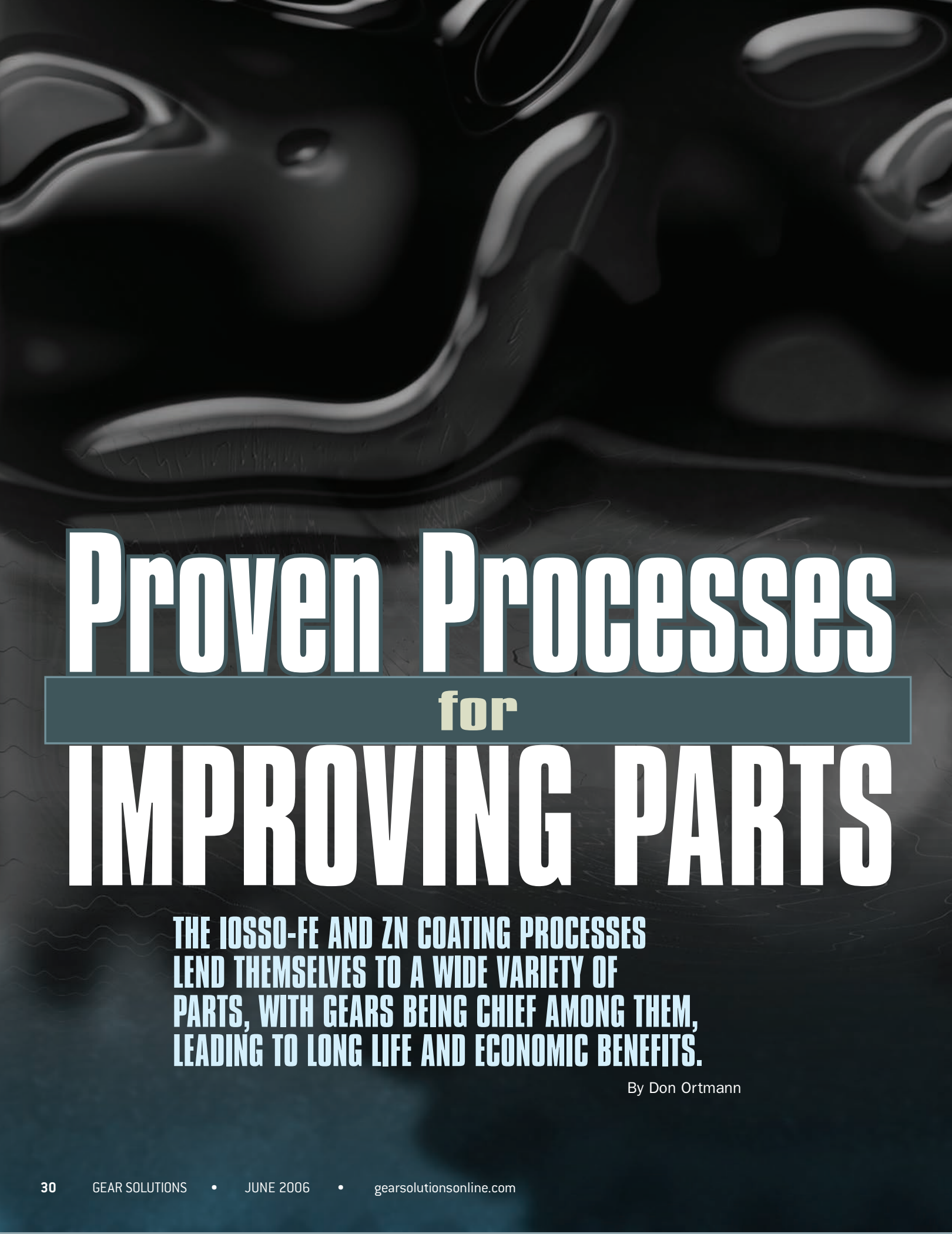


Proven Processes for IMPROVING PARTS

THE IOSSO-FE AND ZN COATING PROCESSES LEND THEMSELVES TO A WIDE VARIETY OF PARTS, WITH GEARS BEING CHIEF AMONG THEM, LEADING TO LONG LIFE AND ECONOMIC BENEFITS.

By Don Ortmann

It's rare to come across a manufacturing process or method that first promises multiple increases in productivity, and then delivers even more. One such method is known collectively as the "Iosso metal processes," the first of which was developed and patented more than 30 years ago. As can be expected, quite a few refinements and improvements have been made over the years, and the results are repeatable with great accuracy. Processing costs are quite reasonable, as well.

The company which provides these process—also known as Iosso Metal Processes—has an extensive history of coating gears and cutting tools, and the industries served include automotive, medical, aerospace, packaging equipment, food processing equipment, drive system parts, farm and heavy equipment, and plastic injection molding. What are the different process, and how might they benefit your operation? Let's take a look.

Variations on a Theme

The basic Iosso metal process is a chromium alloy treatment that has characteristics far superior to conventional coatings, in terms of extended life and cost efficiency. Specialized versions include the Iosso-FE process, which can be applied to all ferrous based alloys, and the Iosso-ZN process, which is for zinc die castings.

In general, the coating is comprised of many steps, with each carefully and accurately controlled in order to provide the specific results desired. For gears and components or production wear parts, this coating can provide answers to virtually all the common wear-related problems. The Iosso metal processes benefit manufacturers who require parts to have increased hardness, extended wear, lubricity, and corrosion resistance. Additional characteristics of the coated surface are that it is heat resistant, non-magnetic, crack-free, and static-free. There is no peeling, flaking, or spalling. It is anti-soldering, anti-galling, and does not cause hydrogen embrittlement of the base metal, and the coating replicates the original surface finish. Both Iosso-FE and ZN coating coverage is uniform over complex shapes without build-up on sharp edges or corners (see figure 1).

FIGURE 1: GEARS COATED UTILIZING VARIOUS IOSSO METAL PROCESSES

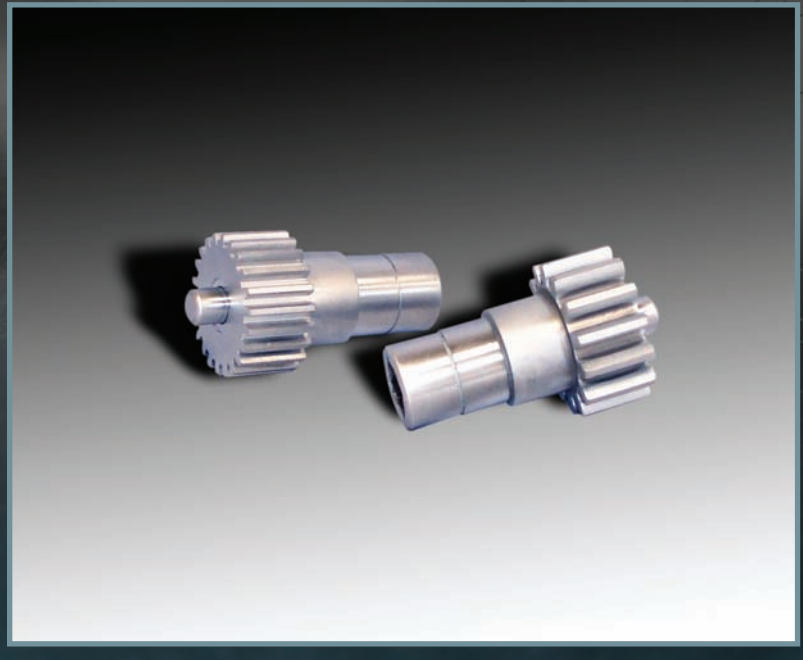


FIGURE 2: MICROGRAPH SHOWING CHROMIUM ALLOY COATING,

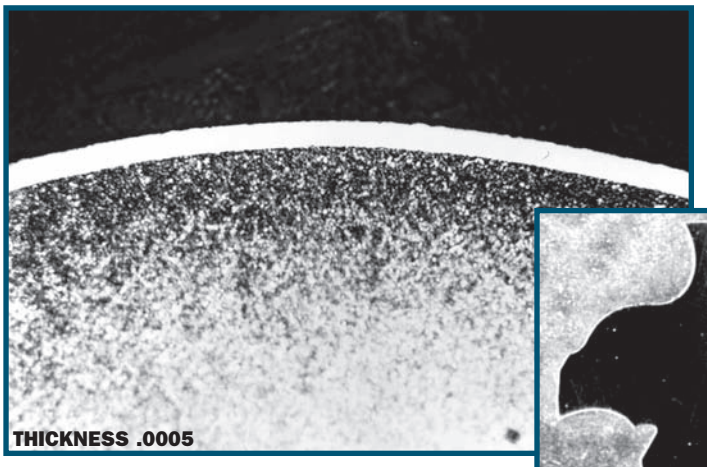
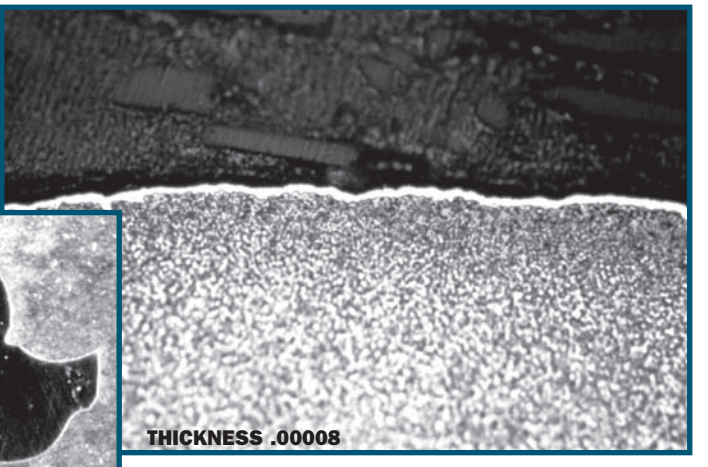


FIGURE 3: MICROGRAPH SHOWING CHROMIUM ALLOY COATING,



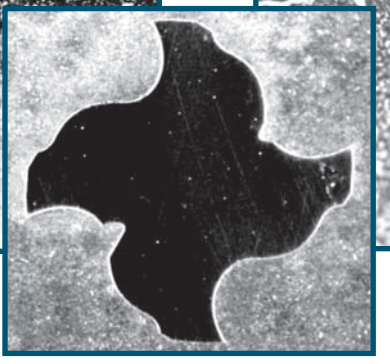


FIGURE 4: MICROGRAPH OF ENDMILL (TOP VIEW) SHOWING UNIFORMITY

For Ferrous Alloys

The Iosso-FE process can be bonded directly to all iron based metals, tool steel alloys, stellite, stainless steel, brass, bronze, beryllium copper, tungsten carbide, and Ferro-tic carbide. It provides incredible adhesion and a very hard surface. The surface hardness can be brought up six to eight points higher than the hardness of the base or heat treated metal, and the thickness of deposit can be accurately controlled from .000020" to .0005". The coating is uniform, even over very complex shapes and corners, and there is no buildup, which makes it well suited for gear applications. The coated gears have enhanced wear with an extended life of six to 10 times normal life. This relates not only to a better gear, but less downtime for machinery in which these gears have been incorporated. It will extend base metal life, reduce corrosion, and increase life expectancy. Moreover, its wear qualities are virtually unmatched by any other coating or surface treatment (see micrograph images in figures 2-4)

As an example, tools for producing a long, high-density powder metal lock housing were coated with the Iosso-FE process. The process produced a uniform non-porous and crack-free coating. Table I summarizes the number of parts produced with the coated tools, as compared to the number produced by using uncoated, and titanium treated tools. The Iosso-Fe coated tools have significantly outperformed their uncoated and titanium nitride treated counterparts. This is attributed to the reduction in die wall friction, which enabled compacting and ejection pressures to be reduced, thus lessening the wear and tear on the tools. Also, the adherence of the coating on the tools is significantly better than is obtainable with conventional plating, the coating is not embrittled with hydrogen, and it is static free. Other observed benefits include:

- Uniform density distribution
- Elimination of cracks because the strength of the compact was sufficient to counteract low ejection pressures
- Easier withdrawal of core rods and pins during ejection
- Better surface finish on sintered parts
- Better correlation between applied pressures and tonnage indicator on the pressure
- Material and labor cost reduction

Results for other chromium treated powder metal parts are shown in Table II. Uncoated parts failed the wear and corrosion test. However, the parts coated by the Iosso-Fe process readily surpassed this test.

For Hardening Zinc

The Iosso-ZN process is a patented proprietary process to harden zinc wear components and parts. This coating process specifically transforms everyday soft zinc alloy parts into hard, extremely wear-resistant materials. This process is a chromium direct electro-deposition bath, which comprises an aqueous chromic acid and sulfate solution. This coating bonds directly with the zinc alloy surface and provides a new surface which is extremely hard and tough. Designers can now incorporate the die cast technology with the Iosso-ZN process to produce economical components with excellent strength and close, precise tolerances. This process puts conventional zinc die castings into contention

TABLE I: PARTS PRODUCED WITH COATED TOOLS, AS COMPARED TO THOSE PRODUCED BY UNCOATED, AND TITANIUM TREATED TOOLS.

Obtained With Ground, Titanium Nitride, and IOSSO-FE Chromium Alloy Coating		
Uncoated/ground	Titanium Nitride	IOSSO-FE Coating
14,000*	45,000*	170,000*

*Parts Produced Prior to Excessive Tool Wear

TABLE II: RESULTS FOR OTHER CHROMIUM TREATED POWDER METAL PARTS

Part Name & Description	Application	Test Result Uncoated Part	Test Result as Coated by IOSSO-FE Process
GEAR *Powdered Metal* **#5008 99% Iron 1% carbon**	Gear is used on a copy machine	**FAILED**	Exceeded required wear test by at least 186 hours
FLYWEIGHT *Powdered Iron* **#FN-o208-30 Copper Infiltrated in arm**	Flyweight is used for engaging and disengaging start windings of electric motor	**FAILED**	Exceeded required wear test by 32%
GRIND RING *Powdered Metal* **# FX2008 Copper Infiltrated**	Grind ring is used on industrial type garbage disposal	**FAILED**	Surpassed, both required wear and corrosion tests

to replace many of the expensive previously used alloys. Design engineers can now look to various grades of zinc and have the confidence to implement them into their precision-designed parts, with zinc now becoming an economical and feasible means to manufacture parts.

The Iosso-Zn process is controlled to provide critical mechanical tolerances with superior uniform coverage. With the application of this coating, surface hardness can now be increased to up to 72 R.C. levels. The range of thickness to achieve superior surface hardness is a controlled tolerance from .000050 to .0005 of an inch. The surface finish will replicate the original surface condition.

The graph in figure 5 depicts the hardness of six grades of zinc on the Brinell scale. Figure 6 depicts the R.C. hardness of the same six grades of zinc after being coated with the Iosso-ZN process.

Easy Evaluation

The processes described can be applied to items varying in size from a 3/16" OD gear to a six-foot shaft. Production wear parts can include gears, shafts, pinions, cams, rollers, valves, pistons, roll forming dies, blades, knives, cutters, slitters, scissors, molds, dies, cavities, cores, ejector pins, punches, cutting tools,

CONTINUED ON PAGE 50