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How To Maintain Joint Strength When Converting From Metal To Plastic

by John F. Firlik
Product Specialist
SPIROL International Corporation
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Value Engineering in its truest form is the process of reducing the cost of a product without sacrificing performance, appearance or lifespan. Components from almost every industry, from vacuum cleaner housings to automobile engine components, are converted from metal to plastic to accomplish this goal. Designing high-performance plastic components can be challenging, particularly when trying to achieve similar mechanical properties as metal assemblies.

Characteristics of the plastic components can be improved by adding strength enhancing features to the plastic such as glass or mineral fillers. The weakest section of the design then becomes the joints and assembly points. Metal threaded Inserts significantly improve the joint strength permitting the proper torque values to seat the bolts. Using Inserts, these joints do not become loose over time. Additionally, the Inserts enable unlimited assembly/disassembly of the components without compromising the integrity of the threads. It is the metal Insert that allows designers to replace cast or machined metal components with less expensive plastic without sacrificing performance.

Start with the performance requirements of the assembly, and then select the appropriate Insert. The installation method must be considered, as this will affect the Insert that is chosen as well as the overall cost of the assembly. Mold-in Inserts usually yield the highest performance, yet this form of installation is by far the most expensive. In addition, you run the risk of damaging the mold if the Insert is not properly positioned during the molding process. This can result in tens of thousands of dollars in lost profit.

Typically, Inserts installed with heat yield the best combination of overall performance at the lowest installed cost. Post-mold installation, such as with SPIROL's Model HA Automatic Heat Insert Driver, is very efficient, eliminating the tedious requirement of properly loading Inserts into a mold during the mold cycle.

Access to each Insert position should be clear with as few different elevations as possible. The outside diameter of the boss (area around the hole that accepts the Insert) should be 2-3 times the Insert diameter. First consideration should go to a symmetrical Insert, as they are simplest to feed.

Following this formula for success, most components can be specifically designed to preserve the initial cost savings pursued.

SPIROL Series 30 Heat-Ultrasonic Straight Hole, Brass, Headed Insert

Brass Insert at connection point on a chrome-plated ABS plastic gear housing assembly.

Model HA Automatic Heat Insert Driver

SPIROL Model HA shown without guard

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Application Engineering

SPIROL Series 28 Heat-Ultrasonic Straight Hole, Brass, Headed Insert

Model HA Automatic Heat Insert Driver

Application:

A specialized molder of chrome plated plastic automobile components wanted to improve their production efficiency, and enhance the quality of their final product in a very competitive environment. Their existing process called for installation of a steel threaded Insert into their various door handle covers after the molding process. They were manually installing the steel Insert by using an induction heating unit and a simple press. The installation process was extremely slow due to manual loading and the poor thermal conductivity of the steel Insert. In addition, if the Operator unloaded the assembly too quickly before the Insert cooled, the Insert would float out of position in the molten plastic. This process yielded erratic performance results. Production time was approximately 30 seconds per assembly, and the scrap rate was 8%.

Solution:

After a comprehensive evaluation, SPIROL Application Engineers recommended replacing the steel Insert with a headed brass Insert, and installing it with a standard Model HA Automatic Heat Insert Driver. This machine automatically feeds, orients and delivers the Inserts to a heat chamber. The Inserts are quickly heated and ready for installation upon demand. The operator simply loads the component into a fixture, and activates the machine via dual opto sensors. The machine advances, installs the Insert, retracts and resets. The brass Insert begins cooling the moment it starts to enter into the plastic, and by the time it is fully installed, it cools enough to stay in its final position. The production time is less than 10 seconds, scrap is eliminated, and the final product yields consistent performance.

SPIROL offers free samples and free engineering support.

SPIROL Application Engineers will review your application needs and work with your design team to recommend the best solution. One way to start the process is to select **Pinning Applications** in our **Optimal Application Engineering** portal at www.**SPIROL**.com.

U.S.A.

Spirol International Corporation
30 Rock Avenue
Danielson, Connecticut 06239
Tel. +1 (1) 860.774.8571
Fax. +1 (1) 860.774.2048

Spirol West Inc.
1950 Compton Avenue, Unit 111
Corona, California 92881-6471
Tel. +1 (1) 951.273.5900
Fax. +1 (1) 951.273.5907

Spirol International Corporation
Shim Division
321 Remington Road
Stow, Ohio 44224
Tel. +1 (1) 330.920.3655
Fax. +1 (1) 330.920.3659

Spirol Distribution
(For U.S. Distributors)
30 Rock Avenue
Danielson, Connecticut 06239
Tel. 1.860.774.8571
Fax. 1.860.774.0487

Canada

Spirol Industries, Ltd.
3103 St. Etienne Boulevard
Windsor, Ontario
Canada N8W 5B1
Tel. +1 (1) 519.974.3334
Fax. +1 (1) 519.974.6550

Mexico

Spirol México, S.A. de C.V.
Carretera a Laredo KM 16.5 Interior E
Col. Moisés Saenz
Apodaca, N.L. 66613 México
ó Apdo. Postal 151 de Apodaca, N.L.
Tel. +52 (01) 81 8385 4390
Fax. +52 (01) 81 8385 4391

Europe

Spirol Industries, Ltd.
Princewood Road
Corby, Northants
England NN17 4ET
Tel. +44 (0) 1536 444800
Fax. +44 (0) 1536 203415
(UK Distributors: Tel. 0800 3890034)

Spirol SAS
Rue Henri Rol Tanguy
Z.A. Les Naux
51450 Bétheny - Reims
France
Tel. +33 (0) 3 26 36 31 42
Fax. +33 (0) 3 26 09 19 76

Spirol GmbH
Brienner Strasse 9
80333 Munich
Germany
Tel. +49 (0) 931 454 670 74
Fax. +49 (0) 931 454 670 75

Asia Pacific

Spirol International Engineered Fastener Trading Co. Ltd.
No. 11 Xi Ya Rd. North
Section A, 1F, Building 14
Wai Gao Qiao Free Trade Zone
Shanghai, China 200131
Tel. +86 (0) 21 5046-1451/1452
Fax. +86 (0) 21 5046-1540

e-mail: info@spirol.com

SPIROL.com

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