SPIROL®
WHITE PAPER

How To Choose Fasteners That Maximize Assembly Life

by Christie L. Jones, Market Development Manager
SPIROL International Corporation, U.S.A.

Fasteners are usually the smallest, least expensive components within an assembly. Even though fasteners usually hold the entire assembly together, they are often overlooked until the end of the design. As important as fasteners are, Design Engineers usually receive no formal training on the mechanics of fastening and joining. (Not something you want to think about next time you are on an airplane.)

An assembly can be held together in many ways: bolts, rivets, screws and pins, to name a few. The methods fall into two broad categories: (1) methods that take two components or two operational steps to stay in place; and (2) methods where the components are self-retaining. The challenge for the Design Engineer is to choose a method that provides the highest quality joint with integrity over time at the lowest manufacturing cost. For many applications, a self-retaining pin is the winning solution. The difficulty is selecting the proper pin with the appropriate strength and flexibility for the application. Technically, when a load is applied, something has to give: the pin, the hole, or an element of the assembly. A pin that is too rigid causes the hole in which it is retained to elongate and leads to eventual assembly failure. A pin that is too flexible will fatigue under dynamic loading.

The Solid Pin's rigidity elongates the hole.

Solid Pins

Solid Pins come in many different forms. Examples include: Dowel Pins, Knurled Pins, and Grooved Pins. In general, Solid Pins are strong, and relatively inflexible. **They do not absorb shock and dynamic loads,** but rather transmit these to the mating components. While there are many applications where a Solid Pin is an effective solution, the dynamic forces in many applications need to be closely examined. For example, there is a common paradigm that Solid Pins are the best option for heavy duty applications. On the contrary, due to the pin's inflexibility, oftentimes Solid Pins damage the holes when used in a dynamic loading application, which leads to premature failure. Additionally, using a softer Solid Pin material reduces host damage, but commensurately reduces the pin's strength. Alternatively, a heat-treated Spring Pin is often stronger than a Solid Pin and its inherent flexibility maximizes assembly life in dynamic, heavy-duty applications.

Spring Pins

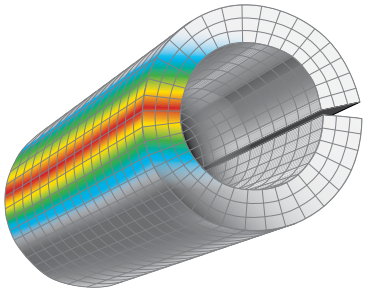
There are two distinct types of **Spring Pins**: **Slotted Spring Pins** and **Coiled Spring Pins**.

Both types share certain characteristics such as flexibility and their ability to accommodate wider hole tolerances than Solid Pins.

Coiled Pins Slotted Pins

Slotted Pins

The pins' flexibility reduces manufacturing costs. However there are several **disadvantages to Slotted Pins** that limit their applicability in new designs – particularly in those applications with a soft host material, such as aluminum or plastic, which are subject to dynamic loading.



Under load, stress is concentrated 180˚ opposite the gap in Slotted Pins.

The Slotted Pin is significantly **less flexible** than the Coiled Pin and it only flexes 180º from the gap. This combination can cause premature assembly failure.

Additionally, Slotted Pins are very **difficult to automatically feed and install**. The most appropriate applications for Slotted Pins are non-critical assemblies, manufactured out of mild to hardened steel, that are manually assembled.

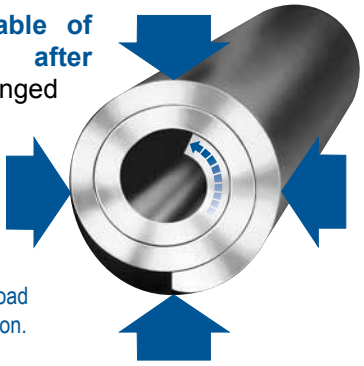
Interlocking does not allow for automatic feeding and installation of Slotted Pins.

Coiled Spring Pins

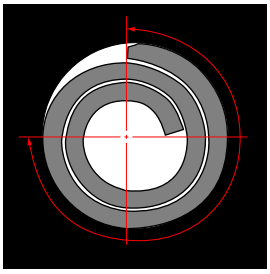
Light, Standard and Heavy Duty Coiled Pins

Coiled Pins were invented to address the drawbacks of the Slotted Pins, and to offer the Design Engineer the flexibility to tailor the pin's strength and flexibility to match the application. This ability to "customize" the function of the pin ensures that each application has the optimum combination of strength and flexibility. Light duty pins are generally recommended for soft or brittle materials. Medium (or standard) duty pins are recommended for use in mild steel and non-ferrous assemblies. Heavy duty pins should be used in hardened components.

The Coiled Pin is the most capable of absorbing shock and vibration after insertion, therefore providing prolonged useful life of the assembly, and it is **conducive for automatic feeding and installation in high volume situations**.



The Coiled Pin flexes under load to absorb shock and vibration.



Coiled Pin has 270º contact with the hole.

Coiled Pins can be used as hinge pins, alignment pins, stop pins and to fasten multiple components together (e.g.: to pin a gear and shaft). Coiled Pins are not usually recommended as cam followers, or where there is limited length of engagement for the pin. These applications are usually best served by a Solid Pin with retention features.

Considering the many different ways to fasten assemblies, it is recommended that Engineers take advantage of the Application Engineering services provided by the manufacturers of engineered fasteners. By partnering with industry experts in fastening and assembly, Engineers can be assured that their assembly will be equipped with the most cost effective solution that provides exceptional performance and preserves the integrity of the application throughout the life of the product.

SPIROL offers free samples and 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.

ISO/TS 16949 Certified
ISO 9001 Certified

Technical Centers

Americas

SPIROL International Corporation
30 Rock Avenue
Danielson, Connecticut 06239 U.S.A.
Tel. +1 860 774 8571
Fax. +1 860 774 2048

SPIROL Shim Division
321 Remington Road
Stow, Ohio 44224 U.S.A.
Tel. +1 330 920 3655
Fax. +1 330 920 3659

SPIROL Canada
3103 St. Etienne Boulevard
Windsor, Ontario N8W 5B1 Canada
Tel. +1 519 974 3334
Fax. +1 519 974 6550

SPIROL Mexico
Carretera a Laredo KM 16.5 Interior E
Col. Moisés Saenz
Apodaca, N.L. 66613 Mexico
Tel. +52 81 8385 4390
Fax. +52 81 8385 4391

SPIROL Brazil
Rua Mafalda Barnabé Soliane, 134
Comercial Vitória Martini, Distrito Industrial
CEP 13347-610, Indaiatuba, SP, Brazil
Tel. +55 19 3936 2701
Fax. +55 19 3936 7121

Europe

SPIROL France
Cité de l'Automobile ZAC Croix Blandin
18 Rue Léna Bernstein
51100 Reims, France
Tel. +33 3 26 36 31 42
Fax. +33 3 26 09 19 76

SPIROL United Kingdom
17 Princewood Road
Corby, Northants
NN17 4ET United Kingdom
Tel. +44 1536 444800
Fax. +44 1536 203415

SPIROL Germany
Ottostr. 4
80333 Munich, Germany
Tel. +49 89 4 111 905 71
Fax. +49 89 4 111 905 72

SPIROL Spain
08940 Cornellà de Llobregat
Barcelona, Spain
Tel. +34 93 193 05 32
Fax. +34 93 193 25 43

SPIROL Czech Republic
Sokola Tůmy 743/16
Ostrava-Mariánské Hory 70900
Czech Republic
Tel/Fax. +420 417 537 979

SPIROL Poland
ul. M. Skłodowskiej-Curie 7E / 2
56-400, Oleśnica, Poland
Tel. +48 71 399 44 55

Asia Pacific

SPIROL Asia Headquarters
1st Floor, Building 22, Plot D9, District D
No. 122 HeDan Road
Wai Gao Qiao Free Trade Zone
Shanghai, China 200131
Tel. +86 21 5046 1451
Fax. +86 21 5046 1540

SPIROL Korea
160-5 Seokchon-Dong
Songpa-gu, Seoul, 138-844, Korea
Tel. +86 (0) 21 5046-1451
Fax. +86 (0) 21 5046-1540

e-mail: **info@spirol.com**

SPIROL.com