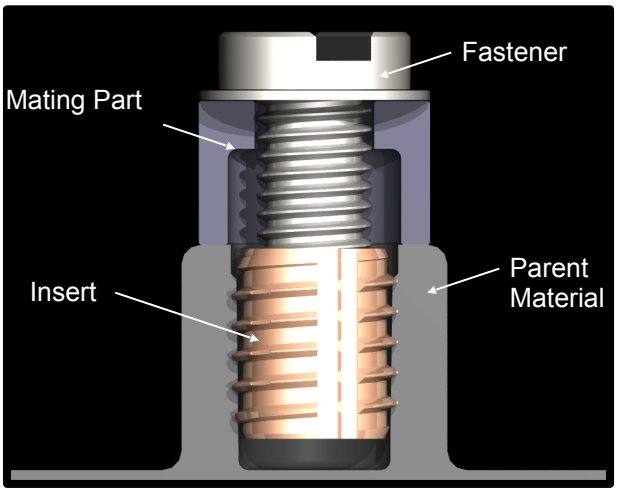
Threaded inserts for plastics: a ten-point guide.

Design engineers who use plastics, composites and light alloys face increasing problems when trying to specify high performance inserts that will give reliable cost-effective assemblies. Andrew Fitzpatrick, group sales & marketing manager of Tappex Thread Inserts, presents ten points to consider when selecting a threaded fastener for use in these materials.

1. The first essential is to understand the intended use of the insert and the mechanical performance specification that it is expected to meet. The mechanical performance of any insert in plastics, composites and light alloys will depend upon how it interfaces with any mating parts, i.e., is it to be clamped to a mating surface or is it to be unsupported and, therefore, rely on its grip in the parent material to prevent pulling out. Some fastener manufacturers including Tappex offer a technical service so designers and moulders should not hesitate to seek their advice.

2. A working knowledge of the proposed production process and the type of plastic to be used is very important. In most instances plastic components are produced by a moulding process. There are a number of different processes used - injection, compression, rotary or blow, resin-injected processes for GRP and composites, and vacuum forming which allow an insert to be placed into the mould tool before the plastic is introduced. This process is described as mould-in and, in general, gives rise to the strongest mechanical performance of an insert. The Tappex HiMould is an example of such an insert. However, the design of a component does not always allow this so, by positioning core-pins in the mould tool, moulded holes can be produced for one of several post-mould insertion processes. Alternatively, parts can be fabricated from plastic sheet; this usually involves machining holes for a post-mould insert. Use of thermoplastic grades which re-melt after moulding or thermoset grades which do not melt is an important consideration when a suitable insert is being selected.



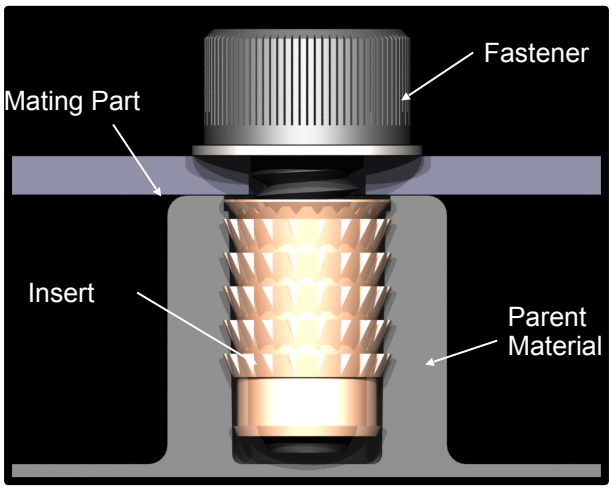
Threaded insert in unsupported assembly.

3. Where possible it is advisable to choose an insert design from a manufacturer's standard range of parts. Usually, test data covering various materials will be available to support use in a particular application. Tappex do offer a design and test service. A further benefit is that standard parts can be obtained in small quantities off-the-shelf for the support of all pre-production requirements. Also they will be readily available to meet production requirements at whatever volume, cost effectively.

4. Although the purchase cost of a fastener is very important, designers need to consider the proposed production process in order to evaluate the true 'in-place' cost of the fastener, i.e.,

the sum total of the fastener piece-part cost plus the cost of installing it into the plastic. Additionally, logistics and in-service considerations are also important.

5. Consideration of the proposed production volumes also plays a part in deciding whether to mould-in inserts or install them after moulding, either beside the moulding machine or as a separate post-mould process at a later date. While processes such as rotary moulding lend themselves to hand-loaded mould-in inserts they can slow the injection moulding process; unless, that is, the production of very large quantities justifies the capital cost of robotics to simultaneously remove the mouldings and load the inserts automatically within the required moulding cycle time.



Threaded Insert in a clamped assembly.

6. The choice of insert material is worth noting. Brass is the most popular because, although more expensive than steel, it can be machined faster, and it can be recycled economically requiring less energy to process overall. For moulding-in, brass components are less likely to damage the mould tool should they become misplaced during the mould cycle. For most applications the resistance of brass components to corrosion does not require any additional and costly plating finish which, in itself, makes recycling difficult. Tappex offers inserts in Brass, Plated Steel and Stainless Steel in both 303 and 316 grades to meet a range of environmental conditions.

7. The choices for post-mould insert design cover press-fit, either cold or with heat or ultrasonic, and self-tapping. Generally, a designer should not choose to press-fit inserts into thermoset material. They are ideally suited to press-cold into softer grades of thermoplastic materials, such as ABS and Polypropylene, or with heat into harder grades, such as Acrylic and Nylons, particularly if they are glass filled or mineral-filled types. Tappex offer a range including Multisert, Microbarb, Trisert, Trisert-3, Foamsert, Dedsert, Suresert and Setsert.

8. Larger sizes of insert can pose problems if they are required to be installed with heat. As significantly more power is required to heat them to the defined temperature, after installation the heat takes more time to dissipate and to allow the boundary layer of plastic to cool sufficiently to fix the insert position in the moulding. Therefore, care in the design of fixtures and in the handling of the moulding is important. As an alternative self tapping inserts can be specified.

9. For many post-mould applications -particularly in all thermoset grades and in harder thermoplastics with glass reinforcement- a self-tapping design of insert provides a cost-effective and reliable solution. For small production volumes it can be a flexible process that does not require expensive dedicated installation equipment. However, for larger volumes installation can be arranged to take place alongside the moulding machine, often by under-utilised labour during the mould cycle period, this will provide significant cost savings over the lengthier heat insertion methods of installation.

10. From a quality standpoint self-tapping inserts, in both male and female threaded forms, provide a monitored production process utilising torque-controlled clutches, and, because the thread is used for the installation, every insert in a finished moulding has to have the correct thread form to have been installed at all.

Summary

All options available for a particular application must be considered based on material grade, process capability, and finished performance to specification. A standard part should be used if at all possible. The alternative is to seek out a specialist manufacturer such as Tappex and ask for a quotation for the production of a special part, placing reliance on the experience of its personnel to incorporate the essential features and tolerances relating to the interface with the plastic.

Tappex are ISO9001:2015 and ISO14001:2015 accredited as well as being able to offer at customer request vision sorting for critical features.

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