12 EXAMPLES OF SOLUTIONS FOR METAL FIXING PROBLEMS

12.1 *Handles and hinges for aluminium windows.*

A well-known manufacturer of handles and hinges for aluminium windows was visited by a CELO technical sales representative. One of their star products were handles for oscillating opening system windows made from zamak, which needed to be assembled on to the handle base and at the same time were fixed to the window frame.

The system used by the customer was:

1. Producing the handle by die casting zamak.
2. Creating the female thread by tapping.
3. Cleaning the part from lubricating oils and zamak chips removal.
4. Painting the part
5. Assembling the part with a metric thread and wave spring washer.

The process has no problems in production, although there were some critical points:

- If the cleaning process was not perfect and some lubricant still remained, the part could not be painted correctly, creating a serious problem regarding the finished look of the products. To reduce this effect, they employed one full-time worker to improve part cleaning. This affected production cost and also became a bottleneck in the production line.
- The tapped hole had to be covered during the painting process to avoid the paint filling the nut thread.
- It was very important not to forget to place the wave spring washer, as it prevented (but not totally) the screw from loosening when opening and closing.

In the past, CELO proposed to use a TAPTITE II® thread rolling screw for this use in order to save assembly costs of tapping, cleaning, hole covering, and spring washer. But the answer was always the same: “our system works”, we have no problems and we cannot take the risk to change. Also, the price of a TAPTITE® screw is significantly higher than my actual cost for a metric screw, and this will not help me to achieve my objective of purchasing price reduction “.

The opportunity came up the day the bottleneck in the cleaning process did not allow a production increase to cover a very large order from an important customer.

Remembering the comments that CELO sales engineers had made to the Technical Department about “some special screws that made their own thread”, the production manager decided to contact us.

The advantages using a TAPTITE II® screw were evident and easy to understand:

I. TAPTITE II® screw creates internal thread directly into the die cast holes, eliminating tapping operations.
II. Elimination of cleaning away operation: there were no particles or lubricants to remove. The painting process was always clean.
III. It was not necessary to cover the hole as the contamination by paint did not prevent the TAPTITE II® screw to form a correct female thread.
IV. The TAPTITE II® screw had a very good performance during insertion, despite the conical shaped hole: drive torque was 0.65 Nm and stripping torque 4.80 Nm. Therefore, the assembly safety ratio was more than satisfactory, which meant that there were no problems in calibrating the screwdrivers on the assembly line.
V. Nobody had even thought of it, but the TRILOBULAR® shape of the TAPTITE II® screw was so resistant to loosening, that using the washer on the handle to avoid loosening.

The production manager summarized the importance of the advantages achieved:

1. *Increased production without investment, moreover, two posts were saved.*
2. *An improvement in final product quality: Finished product had a regular good appearance. Pull out and vibration resistance properties were also improved.*
3. *A SUBSTANTIAL TOTAL COST REDUCTION FOR THE ASSEMBLY DESPITE THE TAPTITE II® SCREW BEING MORE EXPENSIVE THAN THE EQUIVALENT METRIC SCREW.*

12.2 A "noise" in the car

A car manufacturer contacted our technical department to solve a problem: one of the internal components in the front doors for their best-selling model was fixed into place using six metric screws inserted into six welded nuts. *The nuts were welded before painting the door but some welding splashes contaminated the nut thread during the process.*

Due to this, the necessary driving torque to insert the metric screw was so high that the welding spots on the nut broke and felt inside the door panel. If it was the first nut, the line operator could removed it (not without some difficulty). If it was the sixth nut, it was more difficult to repair and sometimes it was felt inside the door. The problems found would often low down the production line, with a significant reduction in productivity. The following additional problems were found.

- The after-sales service received many complaints from clients about "noises" from inside the door (made by the nuts rattling around).
- Some nuts missing caused a lack of clamping in the assembly, to ensure the good working of the electrical components inside the door (electric power window system, speakers, central locking).

Some of the car manufacturer's technicians were aware of the properties of TRILOBULAR® screws; they remembered that there was a screw that "cleaned the paint from inside the female thread". CELO application engineers confirmed that a TRILOBULAR® design called KLEERLOK® was capable of removing paint or welding splashes while installed from the female thread.

CELO engineers ran a large series of tests to ensure that the solution offered was correct. As the final report was handed to our customers' Technical department, one of our engineers asked if there was any special reason to have such and expensive assembly.

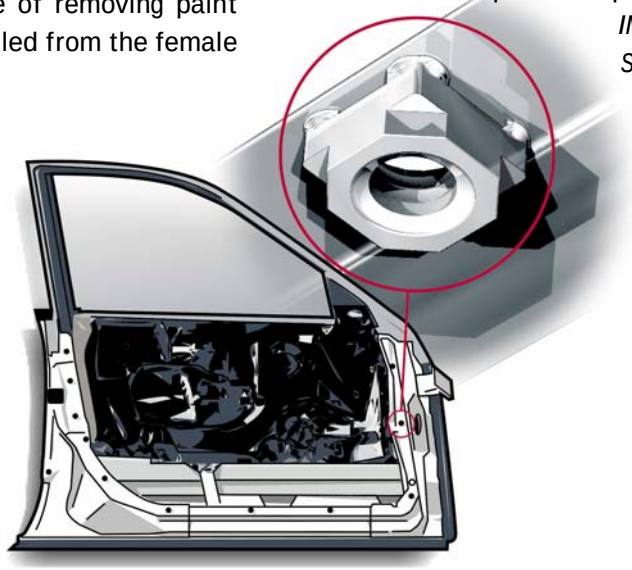
The cost of the components (square, welded nut and screw) was high but above all, the welding process increased the total assembly cost greatly.

Anyone having worked with the Car Industry know-how magic is the word "cost reduction", and our customer's engineers requested to know how this could be done.

CELO proposed modifying the stamping moulds for the metal sheet part, to make extruded holes and use a TAPTITE® CA self-tapping screw. The following advantages could be obtained:

- TAPTITE® CA was capable to eliminate the paint during insertion without any problems. The paint inside the hole did not block the screw.
- It saved the cost of the six nuts and the time needed to weld them.
- The TRILOBULAR® shape of the TAPTITE® CA thread ensured resistance to vibrational loosening.
- It eliminated the cross threading problems they had when using a metric screws.

Our proposal was extensively tested , and finally proved that the TAPTITE® CA screw not only solved the technical problems posed, but additionally offered *IMPORTANT ASSEMBLY COST SAVINGS*.



12.- Examples of solutions for metal fixing problems

12.3 A study of small household appliance motors

We will show you a real example of a technical report that we carry out for our clients. We have obviously eliminated any reference to our client and slightly modified the data so as not to be related to anyone.

At present (September 2008) CELO has a library of more than 1000 cases that allows us to quickly find a solution for everyday problems.

Summary

The possibilities of assembling a metallic system belonging to a motor for a household appliance were determined (see figure 59).

The objective of the study was to determine which alternatives could we offer to:

- Solve the loosening problems caused by motor vibrations.
- Achieve a cost reduction for the assembly.

The client used a metric screw inserted into the metallic base with an extruded tapped hole. The operations prior to machining the hole were costly; in addition, the metric screw became loose due to the motor vibrations.

The following alternative was suggested:

- TAPTITE II® M5 X 30 mm self-tapping screw inserted into extruded untapped hole (ref. CELO TT85Z).

The advantages obtained were:

COST-SAVINGS:

The TAPTITE II® screw eliminated a working post from the assembly line as it was not necessary for someone to carry out the following operations: metal sheet extrusion and hole tapping. TAPTITE II® screw creates its own highly resistant female thread, without the need for extrusion.

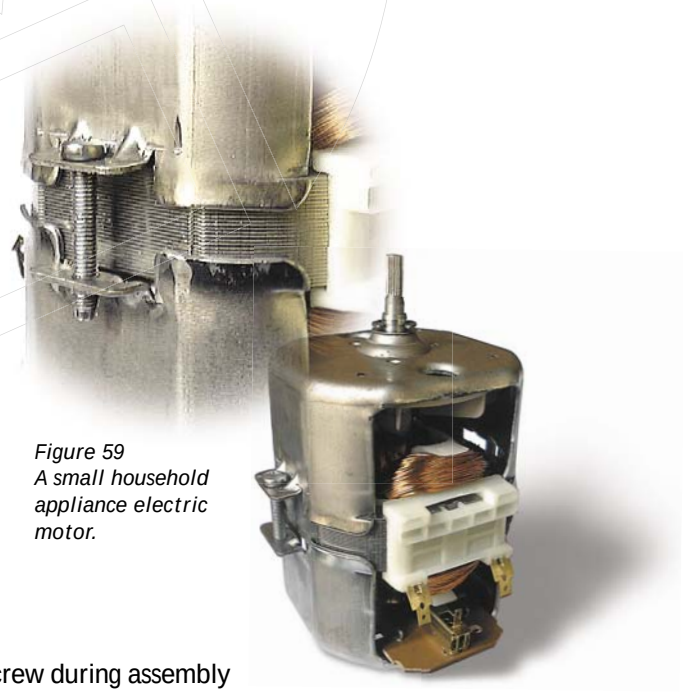


Figure 59
A small household appliance electric motor.

MECHANICAL ADVANTAGES:

1. It eliminated the vibrational loosening problem: TAPTITE II® screw creates its own female thread in the metal (there is no clearance).

2. High assembly clamping: during insertion, TAPTITE II® screw increases effective thread length in the metal, which allows increasing the tightening torque to guarantee clamping.

3. It eliminated eventual cross threading problems: TAPTITE II® screw creates its own female thread, making it impossible for the screw thread to become cross-threaded in the nut.

4. As shown in the insertion test carried out, the behaviour of the screw during assembly is excellent for its high safety margin: low drive torque and high system fail torque (thread stripping).

For the reasons given, CELO S.A. recommended using TAPTITE II® M5 x 30 mm threaded screw in the system.

Procedure

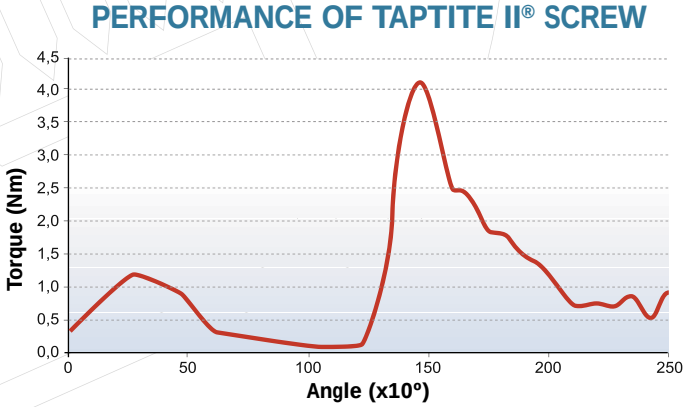
The materials used in the tests were the following:

- Low revolution screwdriver (approx 400 rpm).
- Torque data was obtained using an Electronic Acquisition Data device (Schatz Accrat) measuring torque respect to rotation angle.
- Callipers.
- Steel metal sheet 1.5 mm thickness, to simulate assembly and to be able to carry out threading tests.

4.5 mm smooth drilled holes were made in the steel metal sheet where the TAPTITE II® screws were tested.

The insertion tests gave the following torque values:

Test	Drive torque (Nm)	Fail torque (Nm)	Safety ratio
1	1,07	4,14	3,87
2	1,00	3,84	3,84
3	1,39	3,89	2,80
4	1,29	4,18	3,24
5	1,32	4,82	3,24
Average	**1,21**	**4,07**	**3,40**



12.- Examples of solutions for metal fixing problems

12.4 Refrigerator door

The substitution of a metric screw + toothed washer for a TAPTITE II® screw in a refrigerator door SAVED COSTS for the following reasons:

- Elimination of hole preparation operations: tapping, chips removal and lubricating.
- The cost of additional assembly elements: toothed washer.

IT INCREASED PRODUCTIVITY BY:

- Inserting the TAPTITE II® screw directly into the hole, without needing to position the washer.

Additionally, ASSEMBLY PROBLEMS WERE SOLVED:

- Loosening caused by door movement.
- Reprocessing parts caused by cross threading and thread stripping.

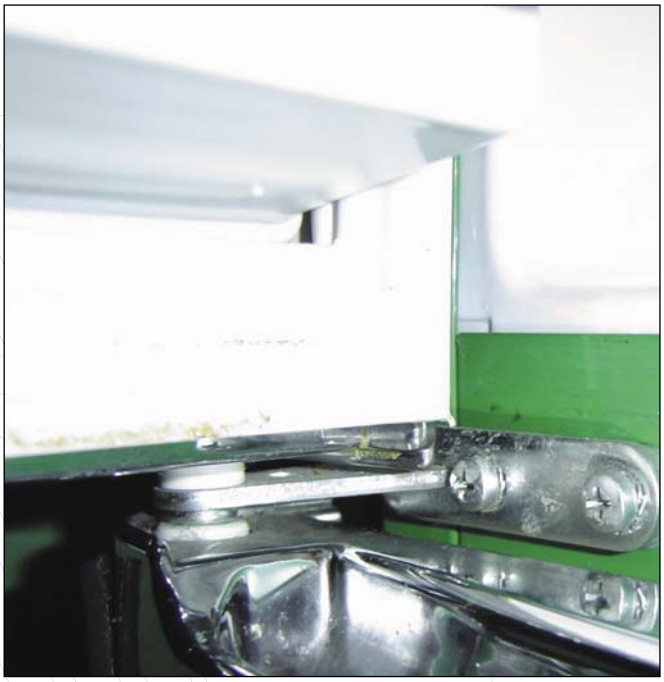


Figure 60
Refrigerator door hinge.

12.5 Aluminium valve body

The operation for tapping the female thread and chips cleaning for four holes in the die cast aluminium body of a high-pressure valve, caused the production manager to look for an alternative: in addition to the time invested in hole tapping, it caused an important bottleneck in the production process.

The cost saving using TAPTITE II® screws was estimated at 43,000€ regarding the reduction in time and the pre-assembly associated costs.