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INTRODUCTION TO NUT WELDING

With the introduction of motorcar and various other products manufactured on assembly lines, a fast effective method of drilling and tapping holes was needed. Probably during the early stages the motorcar body parts were of sufficient thickness to allow drilling and tapping. This was time consuming. It did not take long before someone came up with the idea of drilling the body and welding a nut on with a gas torch or arc welder.

With the discovery of resistance welding and its many applications i.e. projection/spotwelding, it wasn't long before the more effective method of resistance welding nuts was introduced.

The idea behind projection nut welding is that a standard type nut can be manufactured with projections on it, located between the electrodes of a resistance welder, with correct pressure, current and time welded to a metal body part. This reduces time and allows for the design of light i.e. thin metal parts that have nuts welded to them.

PROBLEMS ARISING FROM NUT WELDING:

There are basically four types of projection weld nut. They are: -

1). The hexagon nut
2). The square nut
3). The extruded nut
4). The Bush or turned nut

1). **The hexagon nut** – is similar to a standard nut shape. It is a six-sided nut with three projections and a locater ring. The nut is in common use throughout the motor industry. It is used in all sizes from 4mm up to 18mm.

2). **The square nut** – is a four-sided nut with four projections i.e. one in each corner. This nut has no location ring and uses a special nut-welding electrode that helps center the nut to the body part. These nuts are very common in Europe, Japan and America.

3). **The extruded nut** – can only be used for projection welding. It is manufactured out of pressed sheet metal. The square and hexagon nuts can be used as standard nuts but the extruded nut cannot. The nut is used for safety belt anchorage and sometimes in other critical areas but not in such common use as the other two types of nut.

4). **The bush or turned nut** - is manufactured on a lathe and normally used on special applications such nipples for water, gas, oil or air.

INTRODUCTION TO NUT WELDING

When projection nut welding, each type of the four nuts gives rise to its own specific type of problems. Many of the plants we visit are resistance welding their nuts and then reassurance Mig welding the nuts. This is time consuming and costly if you take into consideration the factors of gas, labour and non-standard operation costs.

When welding the hexagon nut, we normally find three major problems. They are:

a). Nut size
b). Projection accuracy
c). Locater ring

When welding hexagon nuts in sizes from M4 to M6 it is often found that the nut welding machine has not been set correctly or that it is setup for larger nut sizes as well.

Bearing this in mind a large amount of heat and time passes through the nut, when with the correct setting, this causes the nut to collapse and compress the threads. A re-tapping operation is necessary and if the torque tools are used, many nuts tend to come loose in the trim shop.

The complex shape of the hexagon nut and the manufacturing processes used to make them give rise to inconsistent projections. As the tooling produces more and more nuts, the quality level drops. Since there are only three projections on a hex nut, it is important that they are of high quality. If, by chance one projection is of bad quality, then the probability of a nut coming loose is increased by 33% if not more.

The locater ring, even though it helps with the location of the nut and stops the need for special location electrodes, has a bad tendency to short circuit current needed on the projection through itself and into body part. This has the effect of creating a bad weld.

In the majority of cases we have seen on our visits around the country, at least one if not all of the problems mentioned above with hex nuts are present.

Due to the shape and manufacturing processes of the square nut, it is found a more effective type of nut to weld. Having four projections, the probability of a bad projection effecting the weld is lower. The square nut has the same problem as the hex nut when welding 4mm to 8mm weld nuts where collapsing due to incorrect settings is caused.

Normally the square nut is bulkier than the hex nut so collapsing is not that severe. The square nut does not have a locater ring but has to have a special electrode to locate body part to nut. This stops any current short circuit and allows all current to go on to the projections.

The extruded (projection) weld nuts are used in special operations such as safety critical areas. The setting of machines and the condition of electrodes for welding are checked continually. During the manufacturing process the nut is pressed and not cold headed as the case with the hex and square nuts. It is very seldom that we find problems with the extruded nut.

SOLVING THE WELD NUT PROBLEM:

If we take into consideration points for and against each design, we could end up with this situation.

1). Both square and hex nuts collapse under excessive heat/ pressure.
2). The square nut has more projections, thus improving reliability.
3). The square nut is a simpler design and easier to manufacture.
4). Hex nuts do not require special location electrodes.
5). Hex nuts loose weld current through the locater ring.
6). The square nut has a 25% higher weld strength.

The extruded nut will be discussed as a projection body part in a later chapter.

As shown in the above, the square nut is superior to the hex nut, if a design modification is made to the square nut, this can be raised to four out of five points.

SQUARE NUT MODIFICATION/IMPROVEMENT:

As discussed, the two worst problems found with weld nuts are:
a). They are coming loose.
b). Thread stripping, due to thread compression.

If we take the square nut as a standard and strengthen it, we can stop thread compression, increase weld reliability, reduce machine changeover time, and lower piece part price.

The method used to strengthen the square is simply to standardize on the nut blank size, i.e. for weld nuts sizes 4mm to 8mm, the blank size is for 8mm. For 10mm up to 12mm, or 14mm the blank size is for 12mm or 14mm.

With the introduction of two standard nut sizes covering six to seven thread sizes, projection nut welding machines can be set for a high or low setting. If the machine is fitted with a dual stage timer and Prog. 1/Prog. 2 switch, any size can be welded with no machine resetting necessary.

When using a square weld nut a special weld nut electrode must be used. There are many systems in use. The unit marketed by ‘Westken’ is nicknamed **‘The Nutter’** part number TWE 100 and since its introduction has proved itself immensely. The ‘Nutter’ is an air operated unit with the electrode PI insulated from the copper die. **The Nutter** is a five-part assembly with interchangeable parts to allow it to weld nuts, small projection welding parts, weld studs and safety belt nuts. All this is achieved by changing one small part. We have used air, even though a spring version is available, because it is more reliable than a spring, cannot cause arcing and thread damage and air helps cool the weld area on the electrode as well as the piece part. **The Nutter** uses a tapered pin and not a stepped pin, this stops arcing on the threads and also makes **The Nutter** easier to use in production. The tapered pin lasts longer than a stepped pin. A special water-cooled jacket is also available for large nut welding.

THE WELD NUT AUTOMATED:

There are automatic nut feeders which enable a nut to be picked up from a hopper and placed onto the electrode at high speed. Westken market the 'Westken Automatic Nut Feeder'.

On some nut feeders each nut size must have its own machine or have time consuming adjustments carried out each time a new size is used. The machines operate with the same basic concept:

a). Nuts are placed in a hopper.
b). Air drives the hopper and feeds nuts to a feed corrector.
c). After feed correction the nuts are fed to a magazine.
d). From the magazine the nut goes to a pickup point.
e). A pin retracts past the pick-up point and on its return, stroke picks up the nut and places it onto the electrode.

NOTE:

If the square nut is used with a standard blank size, the only change to the machine for different nut size is the pick-up pin. Changing of the pin takes ten minutes as against thirty minutes and many more parts.

SETTING FOR WELD NUTS:

Because of its size and its projections, it is found that a short time and high bursts of current is used to weld the nut. Often in a production situation the weld nut and the machine carrying out the welding operation are not always in perfect condition, therefore setting up as per the book does not always work. If projection weld nut is welded using sufficient pressure, low time cycle and sufficient heat and the weld nut still does not hold a slight reduction in pressure, which increases the resistance, may be all that is necessary. It is a fact that the hex nut is harder to weld than the square nut.

The purchase of projection welding equipment is not necessary for the welding of weld nuts. A standard 100KVA pedestal welder fitted with suitable electrodes does the job sufficiently. Pressure is not as important as current and time in the welding of nuts and as stated above the quality of the weld nut is very important. If problems are being experienced with weld nuts, check the projection first, this is where 90% of weld nut problems are caused.

If you are not sure, please phone and ask, we will help.

If you are experiencing weld nut, resistance or stud welding problems or enquiries please do not hesitate to contact us on
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Introduction to nut welding,
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