

A METHOD OF FABRICATING THREAD PROTECTOR

TECHNICAL FIELD

The present invention relates, generally, to a method of fabricating thread protector
5 which is useful for safely transporting oilfield piping, and specifically, for connecting of piping in the field of oil drilling.

BACKGROUND OF THE INVENTION

Pipes are tubular goods use in the drilling industries or in production of oil and gas, experience a considerable amount of handling and a certain degree of mishandling
10 and abuse on their journey from the steel mill to the final well destination. Pipes, such as those used for oil or gas drilling, are often connected at the ends using a male thread portion at one end (the pin end) of a section of pipe that is threaded and connected to a female thread portion (the box end) of another section of pipe. The threaded ends of a pipe are subject to damage when not in actual use. Pipes are
15 often dropped or impacted by other outside forces. "Thread protectors" are commonly used to protect the threaded ends of a pipe.

In the Oil and Gas industry, a thread protector is used to protect the threads of pipe in the course of transportation and storage. In general, thread protectors are generally manufactured from plastic or steel material and can be applied to the pipe
20 manually or automatically by ways of machineries. Metal thread protectors can be cleaned and re-used while plastic thread protectors are often collected and re-used or recycled.

A considerable amount of development work has been done in efforts to improve the production of the thread protector for use in Oil and Gas industry.

25 Currently, there are two commonly available processes in the market in the manufacturing of thread protectors. The first method of manufacturing comprises the steps of (i) cutting sheet metal to an appropriate size; (ii) rolling and welding the cut sheet material to form a work-piece having the shape of a thread protector; (iii) machining the work piece; and (iv) a heat treatment. The second method of
30 manufacturing comprises the steps of (i) casting and (ii) cutting the casted metal sheet to form a work-piece having the shape of a thread protector; and (iii) proceeding the work-piece to heat treatment.

U.S. Pat. No. 5,524,672 to Mosing, et al, and U.S. Pat. No. 5,819,805 to Mosing, et al, each being assigned to Frank's Casing Crew and Rental Tools, Inc., are two such prior art patents. The prior art has typically used components which are in intimate contact with the male threads, and while they oftentimes have been used with a great deal of success, have sometimes failed to protect the threads when the tubular is dropped or banged against hard surfaces such as rig floors of ramps and truck bodies. This is especially true when such prior art protectors are used with two-step threaded oilfield tubulars having premium threads.

U.S. Pat. No. 5,706,894 shows a device for suspending various downhole tools below the device for repair and maintenance purposes.

SUMMARY OF THE PRESENT INVENTION

It has been an object of the present invention to provide a method of making a thread protector comprising the steps of:

- (a) cutting of a metal sheet or seamless tube for forming a thread protector;
- (b) applying a punching step to the form the sheet or tube to obtain a work-piece;
- (c) metal-spinning the work-piece by mounting the work-piece onto the drive section of a lathe machine with an application of an external force by means of a levered tool;
- (d) implementing a combined spinning and machining technique to create the thread profile on the Protector obtained in Step (c) such that no further machining is required after the final spinning.

An object of the present invention is to provide a method of fabrication a thread protector, wherein the metal spinning process provides cost advantages over conventional metal forming for the following reasons such as tooling flexibility, improved material yield, reduced material requirements for structurally superior parts.

A further object of the present invention is to provide a method of fabricating thread protector, wherein the tooling for metal spinning is simple and economical to produce, and there is no adding or removing material from the work-piece, therefore, there is a significant cost advantage via metal spinning as there is no material wastage.

A further object of the present invention is to provide a method of fabricating thread protector, wherein the tensile strength of the metal is improved due to metal

deformation and cold-worked on the metal, which allows thinner walled components to be fabricated from lighter gauge materials.

Another object of the present invention is to provide a method of fabricating thread protector, wherein the product obtained has good product consistency and good tolerance achievable.

Still yet another object of the present invention is to provide a fabricating thread protector, wherein the product obtained are of good mechanical properties without additional heat treatment, and thus reduces additional process cost.

The objects, features and advantages of this invention will be apparent to those skilled in this art from a consideration of this specification, including the attached claims, the included Abstract and the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flowchart showing the fabrication process of thread protector in accordance with the present invention.

FIG. 2 is a perspective view showing a partial of a lathe machine used for the fabrication of the thread protection in accordance with the present invention.

FIGs. 3A-3D show schematically the spinning processes in accordance with the present invention.

FIG. 4 shows schematically a thread protector obtained in accordance with the fabrication method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 4 of the drawings, a cup or bowl-like relatively thin piece of thread protector 100 according to the present invention is shown. The thread protector 100 has a thin shell 102, generally ranging from 3 mm to 9 mm. The shell 102 is first formed by light-cutting of a metallic material for instance, steel sheet material into appropriate size, greatly depending on the diameter of the pipes to be mounted onto.

The thread protector 100 thus obtained can be cleaned and re-used. In accordance with the present invention, a metal sheet, such as steel metal sheet is obtained and a light cutting process 100 is employed to cut the steel sheet to obtain a work-piece for forming a thread protector. The size of the cut-sheet is ranging from 100 to 200 cm, the exact size of which is depending on the diameter of the pipes to be protected.

A punching step 200 is applied to the light-cut steel sheet such that a cylindrical, bowl or cup shaped is formed. The obtained work-piece is then processed to a spinning process either manually or automatically using lathe machine. As shown in FIG. 2, in the spinning step, a formed block (mandrel) 22 is first mounted in the drive section of a lathe machine. A pre-sized metal disk or work-piece is then clamped against the formed block 22 by a pressure pad or clamp (see diagram) which is attached to the tail stock 24 of the lathe machine.

In this spinning process 300, the formed block 22 and the work-piece 28 are rotated simultaneously at a speed ranging from 800 to 1200 RPM. A localised force for instance by using a roller tool 26 is then applied to the work-piece 28 to cause the work-piece 28 to flow over the block 22. Generally, the force is usually applied via various levered tools. For fabricating simple thread protector, the work-pieces 28 are just removed from the block 22, but for more complex shapes of thread protectors, a multipiece block is required. This is due to the fact that the final diameter of the work-piece is always less than the starting diameter and therefore the work-piece must be thick, elongated radially or buckle circumferential.

FIG. 3 shows the applying of levered tool in sequences onto the work-piece in accordance with the present invention. FIG. 3A, the work-piece 28 is clamped between the mandrel (block) 22 and a or pressure pad or a clamp 30 in accordance with the present invention. A localised forced is applied by using a levered tool such as a roller tool. As shown in FIG. 3B-3D, the forced is applied onto the work-piece and a thread protector is obtained and is shown in FIG. 3D. Under this spinning step 300, the work-piece 28 is rotated at high speed and is formed into an axially symmetric park. The process 300 is generally performed using CNC lathe machine or by hand spinning technique if the thread protector is a simple one.

The work-piece 28 after the spinning process is then undergone a machining step 400. In step 400, the protector are to be threaded by machining. In accordance with the present invention, thread cutting, is used when full thread depth is required, when the blank is basic and when threading a tapered thread.

In summary, the present invention provides a method of making a thread protector comprising the steps of:

- (a) cutting of a metal sheet or seamless tube for forming a thread protector;
- (b) applying a punching step to the cut metal sheet or tube to obtain a work-piece;

(c) metal-spinning the work-piece by mounting the work-piece onto the drive section of a lathe machine with an application of an external force by means of a levered tool;

5 (d) implementing a combined spinning and machining technique to create the thread profile on the Protector obtained in step (c) such that no further machining is required after the final spinning.

10 In accordance with a preferred embodiment of the present invention, a heat treatment step 500 can be applied such that the thread protector are stress relief (after excessive 'cold forming' by the spinning process) or normalized, quenched and temper (for medium and high Carbon and Alloy Steel) to further increase the metal mechanical strength.

15 In accordance with the present invention, the time required for heat treatment is about 20 to 30 minutes for stress relief, and the metal spinning on a seamless tube raw cater provides an 'open end' metal thread protector of all sizes. If the metal spinning is implemented on a metal sheet raw cater a 'closed end' thread protector of all sizes is obtained.

The method of making a thread protector is further comprising the step of profiling of the protector by spinning process cater for 'threadless'.

20 The method of the present invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the method, especially to those skilled in the art.

CLAIMS:

1. A method of making a thread protector comprising the steps of:
 - (a) cutting of a metal sheet or seamless tube for forming a thread protector;
 - (b) applying a punching step to the cut metal sheet or tube to obtain a work-piece;
 - (c) metal-spinning the work-piece by mounting the work-piece onto the drive section of a lathe machine with an application of an external force by means of a levered tool;
 - (d) implementing a combined spinning and machining technique to create the thread profile on the protector obtained in Step (c) such that no further machining is required after the final spinning.
2. The method of making a thread protector as defined in claim 1, further comprising the step of heat treatment to the bowl like or cylindrical shape thread protector to enhance resistance of the thread protector to chemicals corrosion encountered in the oil fields.
3. The method of making a thread protector as defined in Claim 1, wherein the spinning treatment is done manually or by lathe spinning.
4. The method of making a thread protector as defined in Claim 1, wherein a pre-sized metal disk is used to clamp against the spinning block of the Mandrel.
5. The method of making a thread protector as defined in Claim 4, wherein a pressure pad is employed to clamp the metal disk to the spinning block.
6. The method of making a thread protector as defined in Claim 5, wherein the pressure pad is attached to the tail stock of the lathe machine.
7. The method of making a thread protector as defined in Claim 1, a localised force is applied to the work-piece to cause the work-piece to flow over the spinning block of the lathe machine.

8. The method of making a thread protector as defined in Claim 1, wherein a multi-piece block is used for work-piece with complex shapes.
- 5 9. The method of making a thread protector as defined in Claim 1, wherein the work-piece has an elongated radially or bucked circumferential.
10. The method of making a thread protector as defined in Claim 1, wherein the temperature for heat treatment step is ranging from 500 deg. C to 700 deg. C.
10 for stress relief.
11. The method of making a thread protector as defined in Claim 1, wherein the time for heat treatment is about 20 to 30 minutes for stress relief.
- 15 12. The method of making a thread protector as defined in Claim 1, wherein the metal spinning on a seamless tube raw cater provides an 'open end' metal thread protector of all sizes.
13. The method of making a thread protector as defined in Claim 1, wherein the metal spinning on a metal sheet raw cater provides a 'closed end' thread
20 protector of all sizes.
14. The method of making a thread protector as defined in Claim 1, further comprising the step of profiling of the protector by spinning process cater for
25 'threadless' protector of all sizes.