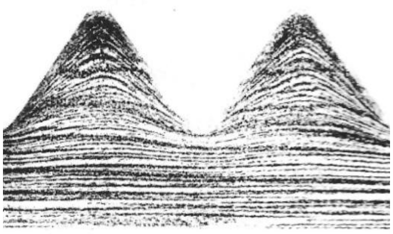
THREAD ROLLING GENERAL INFORMATION



Thread rolling is essentially a cold forging operation.

The thread rolls, when forced onto the component, which has been prepared at the pitch diameter of the required thread, form the thread root, the displaced material flowing outward to fill the rolls and form the thread crest. A complete thread is produced where the grain of the material follows the form of the thread, considerably increasing thread strength.
All thread forms can be produced in a single pass, this includes Acme, Buttress, Knuckle and Trapezoidal threads, though flank angles must be not less than 20 degrees inclusive with a minimum of 10 degrees on either flank. Taper threads can be rolled as long as the thread length does not exceed the roll length. Hollow components, pipes etc, can be rolled with support mandrels.

Other advantages of thread rolling are :-

Economy. Thread rolling is carried out at much higher speeds than thread cutting. This reduces machine cycle time. The blank is prepared at the pitch diameter of the thread whereas in cut threads the blank is at the major diameter, so that more material is required. The overall effect is a reduction in cost per component.

Accuracy. The thread rolling process has the inherent ability to maintain the accuracy of the original machine set up during long or short runs of high speed production.

Physical. The cold forging process enables the thread to withstand greater tensile, shear and fatigue loadings. Also a hardening of the thread surface occurs improving it's wear characteristics.

Surface finish. Thread rolled components have a highly burnished finish. No chips or swarf are produced.

Corrosion resistance. The hard,burnished finish of a rolled thread gives it a high corrosion resistance.

Methods of producing rolled threads.

Rolled threads can be produced by dedicated thread rolling machines, Thread rolling heads, or hand operated thread rolling dies.

We do not offer thread rolling machinery but can supply the rolls required by them. If enquiring please tell us the following:- Roll width, diameter, bore and keyway dimensions, also whether rolls are for through or plunge operation.

Thread rolling heads are basically machine attachments. As main agents for Alco of Madrid we can supply a range of new heads and rolls. We also supply spare parts for both Alco and Fette heads, and can often offer reconditioned equipment. Please enquire. **Thread rolling dies** are also supplied by Alco. Please note that a lot of power is required for cold forming. We do not recommend the use of thread rolling dies for diameters greater than 16mm.

ALCO THREAD ROLLING HEADS

ALCO THREAD ROLLS

ALCO THREAD ROLLING DIES

MATERIAL REQUIREMENT

A minimum elongation of 12% and tensile strength no greater than 110Kg/square mm. This includes most steels, aluminium, cast irons, brass with at least 60% copper and light alloys. If in doubt consult your steel supplier. Material to be rolled must not be harder than HRC 40.

COMPONENT BLANK DIAMETER

It is important that the blank diameter is correct. If the blank is undersize the effective diameter of the thread will be formed but the major diameter will not be fully formed. If the blank is oversize excess material will be forced into the rolls causing excessive loading and possible damage to the rolls.
For small diameter threads the excess material may be forced along the thread causing tapering.
The best option is trial and error, starting with an undersize blank and adjusting until an acceptable thread is produced without fully filling the rolls.
The blank must be concentric, straight, and have a good surface finish. For small diameter fine threads it may be necessary to have a ground finish. A chamfer should be present at the start of the blank and also at the end if the thread is to end at an undercut.The chamfer diameter must always be slightly less than the core diameter of the thread.

THREAD ROLLING SPEEDS

It is important to select the correct rolling speeds to obtain good thread quality and long life of the rolls. The correct speeds depend on the thread form to be rolled, the elongation and tensile strength of the material and the speed capabilities of the machinery in use. When calculating speeds it may be thought, especially for small diameter threads, that the calculated speed is too high, and indeed may not be obtainable with the machine in use. In this case use the highest speed available. If too low a rolling speed is used the material may not flow as required and the rolls and head may be damaged. Thread rolling speeds are always much higher than thread cutting speeds!

RECOMMENDED THREAD ROLLING FEED SPEEDS

MATERIAL	FEED SPEED
Carbon steel to 70 Kg/sq,mm	30-60 m/min
Heat treatable steels to 100 Kg/sq.mm	30-70 m/min
Stainless steels	40-70 m/min
High speed steel, High alloy steel	30-50 m/min
Non ferrous, light alloys, brass inc 60% Cu	60-90 m/min

If the material specification is in doubt, never roll below 30 m/min.

Formulae for deriving thread rolling parameters

Rolling feed speed $V = \frac{D \times 3.14 \times N}{1000}$ m/min

Rolling spindle speed $N = \frac{1000 \times V}{D \times 3.14}$ rpm

Rolling power $\frac{C \times P \times O \times V \times 1.35}{1800}$ Horse power

Rolling time $T = \frac{60 \times L}{N \times P}$ seconds

D = Thread diameter in mm
P = Thread pitch
L = Thread length in mm
T = Rolling time in seconds
N = Spindle speed in rpm
V = Rolling speed in m/min
C = 1 for 'V' form thread, 2 for square form.
O = Material tensile strength Kg/sq mm

COOLANT

To extend the life of the thread rolls an adequate supply of coolant must be provided. Ideally a separate flow should be directed to each thread roll, especially if coarse threads or tough materials are involved. The coolant must be free from mettalic particles to avoid damage to the thread rolls. If turning and thread rolling are carried out on the same machine particular attention must be paid to coolant filtration.
Coolant oils of the sulphurized fatty/mineral oil type with a viscosity rating of 6 are available specially for thread rolling. Most oils may cause overheating of and damage to the rolls. Do not use heavy cutting oils.
For most thread rolling applications a good quality soluble oil mixed between 10:1 and 20:1 is suitable.
Additives such as colloidal graphite and molybdenum disulphite can be used to reduce the friction between the thread rolls and component.
The flow of coolant should be as great as possible. More is required for larger thread rolling heads.
Recommended flows for stationary heads are (litres/minute) :- A0 7-12, A1-A2 12 - 25, A4 - A6 40 - 90
For rotating thread rolling heads these quantities should be increased by 50 - 70%.

THREAD ROLLING PROBLEMS AND CAUSES

PROBLEM	CAUSE
Thread crest not fully formed.	a) Thread rolls require adjustment. b) Threading head loose or faulty. c) Component blank undersize. Increase gradually.
Thread start rough.	Thread rolls approaching component too fast or too slow
Flakes of material in thread.	a) Material unsuitable for thread rolling b) Material grain inconsistent. c) Material has excessive lead content. d) Mettalic particles present in coolant.
Thread major and effective diameter oversize.	Blank diameter too large. Decrease in small increments
Major diameter correct but truncated, effective diameter oversize.	Blank diameter too large. Decrease in small increments Adjust thread rolls down.
Major diameter undersize and truncated, effective diameter oversize.	Adjust thread rolls down.
Major diameter undersize and truncated, effective diameter correct.	Blank diameter too small. Increase in small increments.
Major and effective diameters undersize.	Blank diameter too small. Increase in small increments.
Component is bent after thread rolling.	a) Material was bent before thread rolling. b) Stresses in the material. Anneal before thread rolling. c) Chamfer on blank not concentric with diameter. d) Rolling head and component out of alignment. e) Lead on thread rolls too long, change gor shorter lead.
Component not round after thread rolling.	a) Material was out of round before thread rolling. b) Material grain inconsistent. c) Material unsuitable for thread rolling.
Taper in thread rolled component	a) Oversize blank, especially if small diameter, soft material. b) Wear in rolling head, opening springs weak.
Burrs generated.	a) Head engaging component too fast or slow. b) Incorrect chamfer on component.
Thread rolls damaged.	a) Previously rolled thread (hardened) rolled again. b) Rolling head approached component too fast or slow. c) Blank diameter too great d) Rolling head adjusted too small. e)Component not chamfered correctly. f) Material too hard for thread rolling. g) Swarf or mettalic particles in coolant. h) Insufficient coolant. i) Component bent.
Thread rolling head does not open.	a) Machine stop not properly set. b) Thread rolls jamming due to contaminated coolant. c) Spring or gear broken in head. d) Component pulled from holder as head retracts to open.