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MEMO

To: Sales / General Release **From:** Engineering
cc: **Date:** 1-Jun-09, Revised 9-Jun-10
RE: Shear Coupling – Rolled Threads vs. Cut Threads.

Currently, Hawkeye uses a thread rolling process to form the male threads (pin), and a single-point cutting process to make the female threads (box). The threaded portions of the coupling are AISI 4340 HTSR, which has typical yield strength of *145 ksi.* The maximum tensile force required to separate a shear coupling manufactured by Hawkeye is *45 000 lbf* (*45 kip*) for 3/4 through 1 API 11B sizes, and *70 000 lbf (70 kip*) for the 1-1/8 API 11B size.

Because the API 11B thread profile is a *60°* unified thread profile (UNR), equations (5) and (6) from page 1491 of the 26th edition of the machinery handbook can determine the thread shear area of external and internal threads. Using dimensional and engagement length data from API 11B, calculating the force required to strip the threads results in:

	Force required break (kip)	
Size	*Male (cut)*	*Female(cut)*
3/4	124.1	170.6
7/8	158.2	215.8
1	209.4	281.9
1-1/8	276.0	370.7

Analyzing these values, it is evident that the male thread is inherently weaker than the female thread. However, even though the male thread is weaker, it will still require *2.8* to *4.7* times the force to yield on the male threads, as it will for the shear coupling to separate.

The common conception with rolled threads is that the cold-working improves the strength of the thread *10* to *20%*. With rolled threads, assuming *20%* increase in strength, the following forces are calculated:
(Note: female values are same as above, shown for comparison only)

	Force required break (kip)	
Size	*Male (+20%)*	*Female (cut)*
3/4	148.9	170.6
7/8	189.9	215.8
1	251.3	281.9
1-1/8	331.2	370.7

These values are still significantly less than the force required to break the cut female threads.

The male thread of Hawkeye's shear coupling are formed via rolling for two reasons: it is an efficient process that reduces the machine time of the components, and thus the cost; and, it increases the surface toughness of the male thread, making it more resistant to damage as a result of mishandling. The female threads are not the weak point of the threaded connection, cut or otherwise.

Hawkeye has chosen not to expend capital, effort and resources on developing a female thread rolling process. Based on this data, thread rolling offers no real advantage in the performance of the product. Instead, by using proven and efficient thread forming techniques, we can keep our costs stable in this time of economic uncertainty, which, in turn, keeps our prices stable.

Regards,

Jordan Harris, P.Eng.