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Ref. A Your letter of 13 May 1996 to ASME

I received a copy of ref. A as part of my correspondence from ASME concerning the B1 Screw Thread Standards Committee. I understand the reasons for your concern regarding the Screw Thread Standards because I have been in the same situation.

I am taking the liberty of writing you direct because I ^{am} ~~may~~ be able to clarify some of the problems with Screw Thread Specifications and gaging. I managed a Type 2 Navy Dimensional Laboratory at Pensacola and am a Professional Engineer. We inspected helicopter rotor head, gearbox and engine components. We calibrated all types of screw thread gages and measuring equipment. We did First Article Inspections for DOD Procurement Agencies. Assisted with Accident Investigations and Material Failure Reports. We trained mechanics and inspectors in the use of the Screw Thread Gages. We also provided backup for these experienced mechanics and inspectors when there were problems interpreting the System 22 and 23 gaging information. The majority of the threaded components were Safety Critical.

When the helicopter components Screw Thread measurements were suspicious we would take the components to our laboratory for in-depth measurement and study. Usually the gaging problems were caused by thread form errors. These errors were identified using a Zeiss Gear Measuring Center and other precision equipment. We found that measuring Screw Threads was more challenging than Gear measurement because of problems with size, specifications and formulas.

All of the Safety Critical components were screened using System 23 and indicating type Screw Thread Gages. When there was a significant amount of thread form error more sensitive gaging equipment was required. That is when the laboratory equipment was used. Internal Screw Threads required a cast of a portion the Screw Thread to determine Root Radius and Flank Angles.

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Per Q. Hoover
Add: Brian Sheron
Hr

There are many individuals that will attempt to use system 21 GO and NO-GO Screw Thread gages for all applications. The only question answered by using System 21 is will internal and external Screw Threads Assemble. There is no assurance that the design shear strength requirements will be satisfied. This may be sufficient for some applications but not Aircraft, Submarines, Reactors, Space Vehicles or Boilers. System 21 was workable in many applications when Safety Factors were much larger and the same manufacturer made both the internal and external Screw Threads.

If your engineers require Shear Strength then System 22 or 23 Screw Thread Gaging should be specified.

Another important issue is [?]SPC. The GO and NO-GO gages do not make quantitative measurements. The threading process is either in control or out of control. That is a good process for generating scrap.


It is much better to control the manufacturing process at each work station. If the proper gaging is used at each work station and detailed records are maintained the final inspection can be greatly simplified. Most of the problems we had with gaging helicopter components would have been eliminated.

I remember in particular a beautiful ground transmission gear that was scrapped because of badly formed and undersize Screw Threads. This one error cost the contractor over \$400,000.

The system that we put together in Pensacola evolved through trial and error but at the end it was a very good process for assuring high quality Screw Threads on Safety Critical helicopter components. A Standard for this system would read like a training document to evaluate all the possible Screw Thread errors. If I wrote this standard it would be in two parts: Gaging requirements and Manufacturing Documentation including SPC.

I hope that I have answered some of the questions detailed in your letter ref. A. I would be able to help rewrite the Standards and most of all the Screw Thread equations that are over 100 years old and are based on a perfect two dimensional geometry when the problem concerns three dimensional geometry. It is almost impossible to manufacture a perfect Screw Thread.

Sincerely,


James Krippes P.E.