Mechanical design drawings: They should know that....or should they? Part 2 – Surface finish

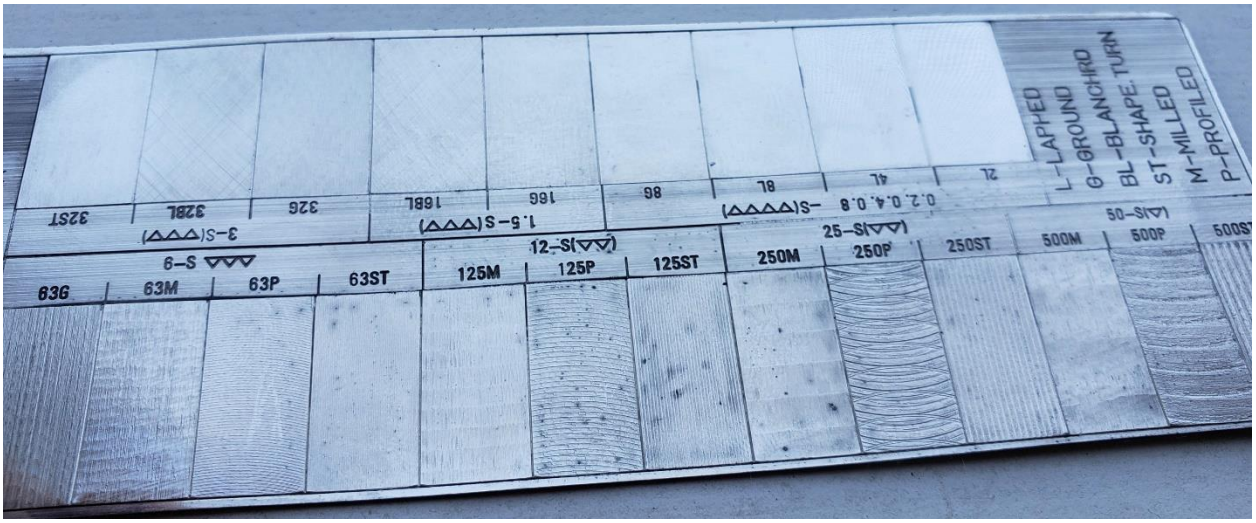
In Part 1 of this series I spoke about the MRB (Material Review Board) and threaded holes in rejected parts Because one or more of the holes had no lead-in countersink the assembler could not get the screw started. Click here to review.

This Part 2 is about surface finish and why neglecting it can lead to rejected parts.

Many of us already know the importance of proper sealing surface specifications. Parker's O-Ring Sealing Handbook includes almost everything you could ask for, including sealing materials, surfaces, seal types, gland dimensions, temperatures, pressures, and assembly/compression tips.

But often, cosmetic issues such as scratches, chipped areas, and overly rough surfaces can result in customer dissatisfaction and rejection.

Company drawing templates typically include a maximum surface roughness specification in micro-inches or micrometers. In my opinion, every designer/engineer should have a Micro-finish Comparator/Surface Roughness Gauge such as this micro-inch version:



When metals or plastics are machined, the depth, tool or part rotational speed, and feed rate will determine how smooth the surface will be. Often a "rough cut" pass is followed by a slower pass. Technically, if a drawing template-dictated maximum surface finish such as 125 micro-inch is the only one in the drawing, a machinist can skip the final machining pass to reduce time and cost.

However, few designers expect any machine shop to do this because –---- "They should've known better." While I certainly agree that many experienced machinists assume that the designer and customer expects dimensionally AND cosmetically good parts, I have seen many that met the drawing specifications but looked, well, horrible. I had to either scrap the parts or expect our company to pay the machinist to take final pass cuts to achieve what the designer and customer expected.

Why not specify what you expect and not assume any better? Often the resulting cost is not really all that much. As you can see in the photo above, a 63T or M finish looks much better than a 125T or M. At least the Material Resource Board, including the Mfg. Engineer, Buyer and Planner wouldn't have to spend their valuable time to have the issue fixed.

Additional tips: If you specify the dimension value, followed by (STOCK) for the thicknesses or diameter, expect that the surface finish will probably not be as cosmetically appealing as that which had been subjected to a "light" machining pass. Sometimes I will specify a slightly smaller diameter or thickness and eliminate the (STOCK) designation.

Acrylic and other clear plastic stock are often covered by a protective peel-off layer. To add another reminder of sorts of expected surface finish, you can add a drawing note that looks something like this: "SURFACES SHALL BE FREE OF VISIBLE SCRATCHES, INDENTATIONS, OR CHIPPED SURFACES."

You can even add an inspection distance after "VISIBLE". Castings are subject to irregularities and companies that either

perform this process (in-house) or outsource it will often create a published Acceptance Criteria Document. For further information about surface finishes, see:

The Basics of Surface Finish | GD&T Basics (gdandtbasics.com)
or SME's Tool and Manufacturing Engineers Handbook (TMEH) – an excellent book (about dozens of various manufacturing processes) that I have had and utilized for many years.