

METALLURGICAL REPLICA CAPABILITY

By Christopher Sykora

While RMS has been involved with metallurgical replicas for many years through the use of outside metallurgists, we have recently brought the labor intensive process of creating the physical replicas in-house. So what are these replicas anyway? They are thin films of acetate that are pressed onto the metallic surface in order to replicate the microstructure of the part in a local area. These replicas can then be viewed under a powerful microscope back in a metallurgist's lab and can also be maintained for years in order to compare with future replicas. They are a key part of the nondestructive metallurgical assessment section of the RLA.

Unfortunately, it's not just as easy as sticking the acetate film on the part. You didn't think this was like playing with silly putty and newspaper clippings did you? There is a five step process for each replica desired. The first step is to do rough grinding of a small (1-2" square) area on the part with 60-120 grit sandpaper. This step removes the large surface imperfections like grit blasting dimples or corrosion pitting. The second step is to do fine grinding on the same area with progressively finer grit sandpapers, down to 600 grit. Each level of sandpaper should be removing the fine scratches from the previous level. The third step is to use a diamond polishing compound to further refine the surface finish of the replica area until it is a mirror finish. This is the most time consuming step and one must be careful not to scratch the area with other tools once it is polished. You can see an example of a polished area in Figure 1. Cleanliness in between all of the sandpaper and polishing is a key to the process. RMS has procured a complete kit of metallurgical preparation materials specifically designed for creating these replicas.

The fourth step is the most dangerous and nerve testing, since if done incorrectly, it means going back to sandpaper grinding again. This step is chemical etching of the metallic surface in order to reveal the microstructure. Some of the chemicals used for this process are powerful acids, so extreme care must be taken and all proper PPE must be worn. The acids must be mixed carefully in the correct proportions and then swabbed onto the surface for just the right amount of

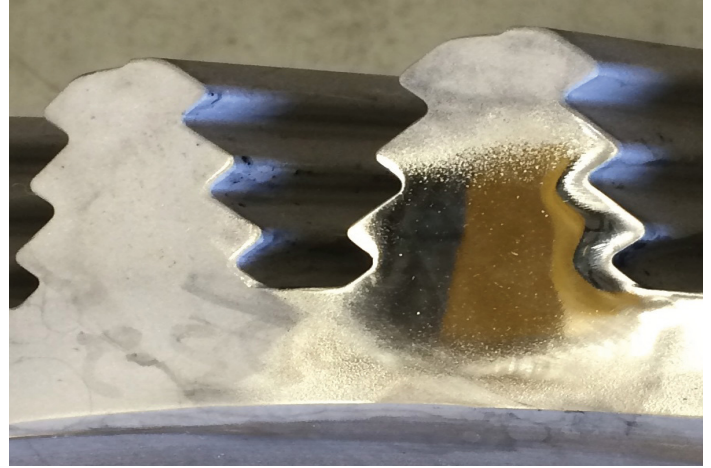


Figure 1

time. Unfortunately, the amount of time etching and even the chemicals best suited for the job is dependent on the type of metal being replicated.

Luckily RMS has gained significant experience on recent jobs with multiple alloys and is fully supported by a very experienced metallurgist who has worked with RMS personnel for over 30 years. The final step of replication is actually applying the thin acetate film to the surface of the etched metal. The acetate is softened with a special chemical, pressed onto the surface, and then forms a reflected replica of the surface of the metal. You can see some example images of a Waspaloy replica (Figure 2) versus a photomicrograph of actual Waspaloy metal (Figure 3).

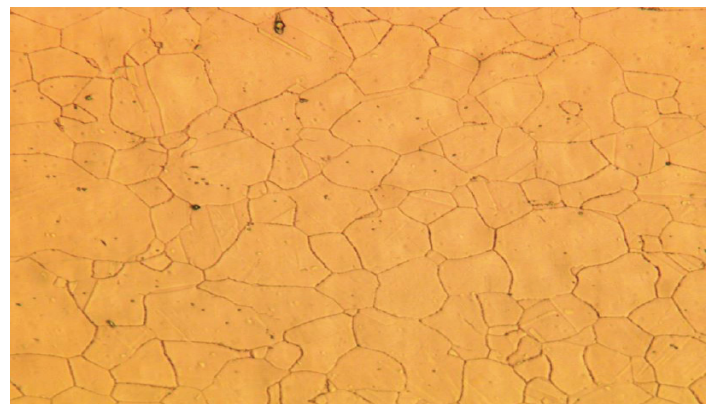


Figure 2

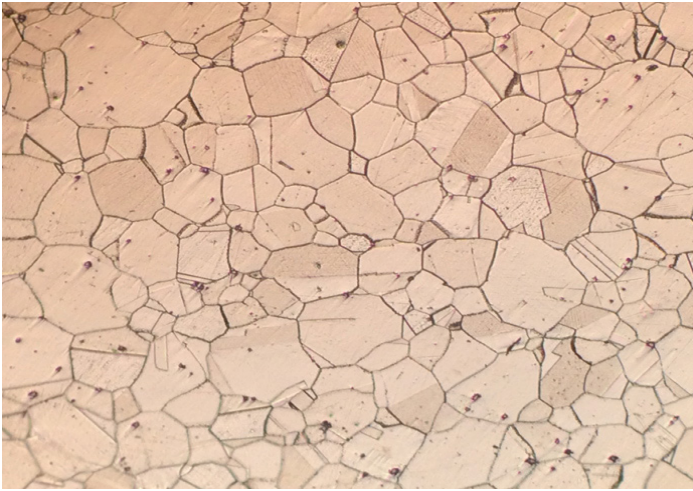


Figure 3

Replicating the microstructure of the metal allows for an experienced metallurgist to evaluate the size of the grain boundaries, look for precipitates, sigma phases, and carbides, and search for evidence of creep damage. Changes in any of these properties of the microstructure relative to a newly forged sample could be indicative of in-service damage from exposure to high temperatures for long periods of time. RMS is excited to have the capability to create these replicas in-house in order to better control the schedule of our Remaining Life Assessments. We are also pleased to have a relationship with such an experienced metallurgist who can provide best in industry evaluation of these replicas and other metallurgical functions.

For more information:

Christopher Sykora
Email: xxxxxxxxxx@rotatingmachinery.com
Tel: 484-821-0702

Headquarters

2760 Baglyos Cir.
Bethlehem, PA 18020

Houston Office

16676 Northchase Dr., Ste 400
Houston, TX 77060



rotatingmachinery.com

Tel: 484-821-0702

Parts: rms@rotatingmachinery.com

Rotating Machinery Services, Inc. | 2760 Baglyos Circle, Bethlehem, PA 18020 | Tel: 484-821-0702

Legal disclaimers text goes here. Nulparum harchic iandam, ut qui omni as adistia doluptis etum consequo te dessitati temquamet aut dolo tem volupta tiuntia aspitatur. Dust facepe volor asit liquae volo quae nos dis dolupic tem quidignat lab int, consenis sitatat emperum que dus aut volorem est enitiis et et iur atis explaut que et es doluptatium ab ipsunt enihillabore optatqui cor arum faccusae necerit lautendis quam int, occabo. Evel id ex essitat hillitatem ea simet lignatibus expel ius excerum fuga.