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PSI

PRODUCT DATA SHEET

FIELD METALLOGRAPHY

Field Metallography describes the practice of performing microstructural analysis outside the metallurgical laboratory. It can include everything from grain sizing of titanium forgings on a production floor all the way to steam boiler failure analysis on a ship. The process required involves all of the specimen preparation procedures performed in the metallography lab. The environment in which field metallography is performed makes it a very challenging endeavor.

Field metallography begins with the very rough grinding of the selected area, usually with a 60 grit abrasive. The beginning surface is often in a much poorer state than any surface found in the lab. Thick scale and rust must be removed in an area larger than the ultimate spot. Each area worked should be smaller than that worked in the previous step. This reduces the opportunity of dragging large particles across a prepared area.

After rough grinding, several fine grinding steps occur. Fine grinding is performed with abrasives in the 120 through 600 mesh range. As with metallography performed in the lab, each abrasive step should remove the surface deformation produced by the previous step.

The next step is polishing of the surface. Like lab work, this is done with polishing cloths and compounds. Because of the importance of turn around time frequently found on field metallography work sites, diamond compounds are preferred over other slower working products. Again, each polishing step should remove the scratches and deformation of the previous step.

Proper etchent use after polishing is usually required to bring out the relevant microstructure. Extra care must be taken with these fluids because of the less than perfect locations requiring field metallography. An electrolytic etchent is used, utilizing either an electrolytic etcher or a 6 volt dry cell battery, alligator clips and a cotton ball.

Analysis and documentation are the final steps in field metallography. A portable microscope is used for the field analysis, but complete documentation and laboratory analysis can be achieved with cellulose acetate tape with a replication technique. Prepared properly and secured in the field with glass slides, field replicas can be analyzed with SEM magnifications with very good results.

The equipment used in field metallography is very diverse. For rough grinding, right angle grinders or portable belt sanders are popular. Fine grinding and polishing can be accomplished with variable speed drills or dremel tools. These tools can be found at your local hardware store. Portable electrolytic polisher/etchers are also used for the polishing and etching steps.

Field metallography, like laboratory metallography, can be properly performed with many different consumables. It is typically required on very short notice to the metallographer. To meet these requirements, PSI maintains an inventory of a variety of field metallography tools.