

# ◆ MetalLife NEWS ◆

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Years of extensive evaluation and testing by NADCA and Case Western Reserve University has shown that optimum tool life is predetermined by some common denominators. Maintenance has always been part of the equation.

Denominators	
Item	Criteria
Steel Selection	NADCA 207-97 (NEW)
Manufacturing	Proper machining & EDM
Heat Treat	NADCA Recommendations
Production	Current SPC Practices
Maintenance	Preventative Measures

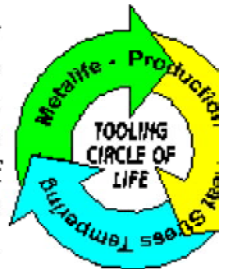
Up until about 5 years ago, most maintenance was reactive in nature. That is, attention was given to things that already happened to the die. Some of these included stopping and restoring heat check conditions with Metalife, removing solder by polishing, and attempting to repair breakout and gross cracking conditions with weld. Numerous die casters and end users still operate in this mode which is analogous to adding oil to your car's engine every time the oil light comes on.

Studies have now documented two of the changes that shorten a die's life and occur during production cycling. These are residual stress build-up and surface softening. The residual stresses and annealing are caused by the constant thermal shock to the tooling. Sometimes this annealing can be further exacerbated by improper statistical process controls (SPC). Procedures and situations such as using a torch to remove a stuck casting, poorly controlled furnace temperatures during stress tempering, or failure to allow a die to properly heat prior to production all contribute to shortened die life.

All die casters want tooling to be resistant to heat checking

too soft lead to premature heat checking while an over hard microstructure can cause gross cracking. Larger tools, with more probability of gross cracking, tend to have lower rockwells, while smaller size inserts get heat treated to higher rockwells that resist heat checking.

As a result of these studies, many die casters have become PROACTIVE. That is, maintenance procedures are structured to prevent softening of the tool's surface and to reduce the build-up of residual tensile stresses. One of these procedures equates to what Badger Metal Tech calls the "Tooling Circle Life". When tooling is NEW and after initial sample the tool is Metalife processed. Then after a prescribed production run or quantity, the tool is heat stress tempered and once again Metalife processed.



This continuing circle of preventative maintenance has a profound effect on reducing heat checking and break along with eliminating soldering and porosity problems. The cycle continues for the life of the tool. Future newsletters will discuss some of these field results using the "Tooling Circle of Life" approach.

One question we often get asked is at what shot count should we reapply Metalife and how often should stress tempering be done? Although much information exists confirming what causes heat checking, little to no data is available that predicts how rapidly the surface is affected by the stress and annealing action. Those that specify heat stress tempering target it to be done at about 20-25,000 shots. Heat stress tempering relieves both compressive and tensile stress. Tempering with heat should be done prior to Metalife, but is this too early or too late?

Ongoing testing by Case Western and NADCA hopes to answer these questions. The Die Materials Committee is now studying "Residual Stress and Softening Effects: Production Dies" which will be discussed in future

and gross cracking. NADCA recommends heat treat specifications that are designed to do this. Dies that are

newsletters. We will also discuss the pros and cons of welding as an existing approach to reactive die repair.

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