MetaLife NEWS

Volume 4 Issue 7 **Solving Soldering Problems - Part 6** **November 1997**

Badger Metal Tech, Inc. N60 W15088 Bobolink Ave. Menomonee Falls, WI 53051 414-252-3804 FAX 414-252-3956
TOLL FREE in the US and Canada - 800-366-1973 —— **WEBSITE - www.badgermetal.com**

What can be done besides lubricating to solve the soldering problems discussed in our August newsletter? We have identified and examined the need to create an effective barrier to prevent the aluminum (Al) alloy from interacting with the iron (Fe). How can this be done and by what means? Coating the die surface appears to be the answer. Are there any special considerations regarding the material substrate prior to applying the coating? We will attempt, in this installment, to **clear the air** regarding these questions, by sharing some of the latest work being done and report on some field and lab test results in this and our next issue.

Although suitable coatings exist, it is still an **"up in the air"** conclusion as to which coating works best at preventing die cast soldering. The Ohio State University in conjunction with NADCA, DOE, and The Die Materials Coating Task Force Committee (DMC) has completed some tests and is planning future evaluations of some of the above coatings. Based on their current results, some die casters have not only seen light at the end of the tunnel but are currently utilizing these coatings to their advantage on a production basis. Badger has also been conducting field tests at numerous sites using Metalife in combination with one of the most promising coatings, Chromium Nitride (CrN).

For these tests a pre-application of Metalife (T-41) was performed prior to the CrN coating. CrN, because of its high oxiding temperature (1300 degrees F), hardness (2500 HV) and ability to withstand the die cast surface expansion/contraction cycle, appears to be best suited for this. This field, however, is new and changes daily. It is not to say that newly engineered coatings, not yet identified, may end up being the future coating of choice. The goal of the above mentioned lab testing is to engineer an ideal coating that will give a minimum of 10 times the reduction in soldering.

Physical Vapor Deposition (PVD) coatings when important to properly prepare the substrate to prevent this f occurring. Metalife Compressive Stress Texturing induce controlled substrate residual layer of compressive stress. T layer will not allow any cracking unless the yield strength of steel is exceeded. Since it is inert, by its nature, the app coating is not compromised. Also the micro-texturing of the surface by Metalife, creates pockets that enhance lube retention on the coated surface, thereby creating another barrier to soldering in addition to the coating.

PVD coatings are low temperature processes as opposed Chemical Vapor Deposition (CVD) types which are applie or above the austenitizing temperature of the steel. Since CVD coatings necessitate reheat treating the die, most casters have no desire to do this. Also, once applied and h treated, future machining to correct distortion is not an op without removing the coating. PVD suffers this same p machining shortcoming, however, no reheat treating necessary since it is done at such low temperatures. Thickn is only 3-6 microns, so there are no dimensional consideratio

Of the four coatings evaluated in the first Ohio State lab/f testing program, CrN gave the best indication of being current coating of choice for die casting applications. Comp and interim findings will be published as articles in acade technical papers and trade publications (e.g. Die Cas Engineer). The Ohio State University will continue their tes and evaluation in 1998 to develop newly engineered coati and substrates for increased life and soldering reduction.

Badger's test programs all involved the use of Metalif combination with CrN. One site was the same one used by Ohio State University for testing CrN without subst preparation. Normally this application would solder after c 900 shots. Our dual process treated cores are now at 15, shots and waiting for yet another production run. Of partic

deposited create a columnar structure perpendicular to the coated surface. When the coating cracks, there are paths to the substrate which can also crack causing the coating to fail. It is, therefore,

interest is the fact that during one of the runs, the water
accidently shut off . No build-up occurred while the dies w
run. Our next newsletter will expand on both field and lab te