Editorial

Change in the Thermal Spray Industry

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Change, in process and materials technology, in R & D funding levels and sources of funding, in corporate structures, ownership, staffing, and capital spending levels, in customer bases and methods of doing business, in standardization, in government regulations, and in the ever-growing global nature of business is certainly affecting the thermal spray industry as it seems to be with all industries. Change has always been with us, but many would agree that the rate of change has been unusually high for the last few years. For many in the thermal spray industry these changes have been very traumatic. We all know colleagues who have lost their positions, of companies that have been painfully "downsized", sold or put up for sale, of reduced operating and capital budgets, and the rest of the litany of woes associated with difficult economic times. Yet there are some hopeful and positive aspects in the current situation.

In spite of the overall economic constraints of today, the range of applications of thermal spray coatings is growing. As an example, for decades aircraft gas turbine engines have been one of the predominant venues for the development of "high tech" thermal spray applications, both materials and processes. Now this market is suppressed, both on the military and commercial sides, and developments and revenues are low. However, there is a renewed interest in the use of coatings in stationary gas turbines and steam turbines that offsets this, hopefully temporary, downturn. Relatively high cost coatings that previously could only be justified in aerospace now find a home in the automotive field; e.g., thermal barrier coatings originally developed for aircraft gas turbines now are being used in diesel engines. One automobile has at least seven different applications of thermal spray coatings applied on-line via plasma spray deposition. Other new and expanding fields of application include prosthetic devices, catalytic surfaces, high emissivity surfaces, and ever-expanding applications for wear and corrosion resistance in virtually every industrial segment.

This expanding range of applications has been driven in part by the need in many industries to improve the quality of their products, as well as the need for longer run times to improve productivity, and to reduce maintenance costs. For example, the demand for better surfaces on the sheet steel used in auto bodies and appliances combined with the higher furnace temperatures required for higher production rates has led to the use of coatings on continuous annealing line hearth rolls to prevent the formation of nodules that may dent the sheet. Similarly, "pot" or "sink" rolls in hot dip galvanizing lines are now being coated to extend run times and improve product quality.

Recent coating process developments, including the expanding use of computer control and robotics as well as improved plasma spray, the reintroduction of high velocity oxyfuel deposition and new detonation gun technology, have led to improved quality and reduced costs. This has allowed an expansion of the use of coatings into a wider economic range of applications as well as into more demanding applications. For example, some thermal spray coatings have always provided superior wear resistance compared to chromium electroplate, but their cost has limited their penetration of the very large chrome market. Now, with lower thermal spray costs and increased chrome costs (largely due to environmental issues), thermal spray coatings are encroaching on chrome's traditional wear markets.

New materials for thermal spray are continuously being introduced, but probably at a reduced rate because of the reduction in R & D in the last few years. What may be considered as "new materials" being introduced at an increasing rate, however, are coatings with more narrowly defined and reproducible properties. This is the result of a broader understanding of the impact of the various coating process parameters (including the powder and other consumables) on a coating's microstructure and properties. Whereas some in the industry have understood this for many years and practiced rigid process control, much of the industry has not. The result has been "generic" coatings with wide ranging

properties and customers disillusioned with the performance of coatings. That situation is rapidly changing with better understanding of the processes, better equipment available on the open market, and better quality powder. As a result, customers of the thermal spray industry, with proper specifications, can be assured of reproducible, narrow band coatings.

In-house funding for R & D within the thermal spray industry has suffered substantially in the last few years. The same has been true within the defense industry which in the past had funded the development of many of the "high tech" applications. It appears, however, that some federal funding through DOE and NIST may become available. It should be kept in mind, nonetheless, that all the major thermal spray processes were developed by private industry and every effort should be made to strengthen in-house industrial R & D. New partnerships and joint developments between major customers and the thermal spray industry should be fostered and expanded. Including the government in these efforts through NIST's CRADA and similar programs could certainly be helpful.

As in any industry, the most important resource is people. Downsizing, rationalization, restructuring, etc., has certainly reduced the number of engineers and scientists in the thermal spray industry. Can those who are left support and develop the business at a rate consistent with the known and potential demand? The old saw of not working harder, but smarter has its limits, but certainly must be given attention. The tools exist today to do far more with fewer people if they are intelligently used. Obviously, appropriate direction must be given as well to avoid useless or dissipated effort. Thus the adoption of an R & D strategy with a reasonable balance between short- and long-term objectives is crucial to make the best use of precious resources, particularly of people. Given the drastic effects of change on people, a major additional challenge will be to change people's attitudes and help them adopt a positive, aggressive approach to what can be a very profitable, rapidly expanding, and exciting future for thermal spray.