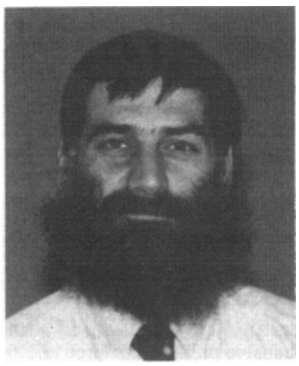
Editorial

The Need to Educate is Paramount

Engineering for Manufacturability



Engineering for manufacturability has significant implications for improving the overall economics and efficiency of an engineered product. Thermal sprayers know that components coated with hard and wear-resistant materials are much better in performance than the as-received component. Therefore, the original component should be left unfinished and then coated before putting it into service, rather than waiting for a future enhancement. Thus, in many ways "thermal spray for manufacturability" has a great potential for economic impact.

The increasing number of applications and the variety of industries that are involved with thermal spray indicate that the field is still growing—despite the dire predictions of the aerospace crystal-ball gazers of the past few years. It is now becoming apparent that thermal spray practitioners, scientists and engineers can be broadly categorized as manufacturers and processors of materials, rather than addressing a single-market application. For example, activities range from processing powders by plasma spheroidization, to manufacturing thin and thick coatings for high- and low-tech applications, to producing net and near-net shapes of ceramics, metals, and composites. An evolving market has indicated that thermal spray can be used for protecting large concrete and metal infrastructures. This represents a departure from using thermal spray purely in a shop environment.

Presently, there are certain bottlenecks that are severely curtailing the thermal spray manufacturing industry; education, for example. The discipline of thermal spray, when viewed in the context of manufacturing engineering, is the nexus between many engineering activities and the realization of a marketable product. Thermal spray has few proselytes since it lies between several engineering fields—such as materials science, mechanical engineering, electrical/electronic engineering, etc.—and this lack of a distinct identity often downgrades the engineering perception of thermal spray. Specifically, thermal sprayers are often thought of as "artists" who use "black box" technology so that every coating can be sold as being unique. Whereas this approach can be healthy from the bottom line of profit over the short term, it is distinctly moribund from the viewpoint of opening new markets and attracting a large and satisfied base of repeat customers. Clearly, "education", in the broadest sense, would remedy this situation and make available existing and new products for the marketplace. It is also possible that the creation of links to manufacturing engineering would bring thermal spray knowledge and technology to a larger audience.

It has been stated that "Manufacturing matters mightily to the wealth and power of the United States and to our ability to sustain the kind of open society we have come to take for granted. If we want to stay on top—or even high up—we can't just shift out of manufacturing and up into services, as some would have it."[1] This 6-year-old statement is related directly to the manufacturing discipline of thermal spray, where now the thrust is on producing an engineering component. The real essence of the problem is that engineering education, at least in the U.S., is not fulfilling the nation's current or future needs. A strong incentive exists for a new and flexible manufacturing engineer to emerge in the immediate future so that diversification and increased manufacturing productivity can co-exist during lean production cycles. Over the last few years, organizations such as ASM International® have taken great strides in this direction by seizing the initiative and producing home study and video courses that are aimed at a thermal spray audience.

In fact, many professional societies are filling a vital need *beyond* the agenda of the engineering schools. The classical engineering school in the U.S. is quite proficient at imparting engineering facts and knowledge but is poorly suited to providing true engineering know-how that enables a young practicing engineer to be productive as soon as possible after graduation. The other needs that a good practicing engineer requires include management and communication skills, how to get the job done in a quick and timely fashion, ability to come in on budget, and many other skills that are normally taught on the job when the young graduate engineer has his/her first placement. These skills are more dominant in time with the career development of engineers, as they become more managerially oriented. For example, "professionals say that today's students are learning design and construction, and they're really not learning about surveillance and oversight over that process; that they need to know about budgets, ethics, and liabilities; and that they don't even know what their professional options are, such as differences among process, product, and project engineers."[2]