Commentary

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Our Thermal Spray Industry*

Dedication to Kobe, Japan

On behalf of all the participants in the ITSC'95 from overseas countries, I would like to express our deepest sympathy and sincere condolence for the deaths, injuries, and destruction of property caused by the Great Hanshin Earthquake which struck the Kobe area on January 17, 1995. We all are extremely impressed with the rapid and steady rebuilding of the city and believe that Kobe will soon be restored to its previous state.

Introduction

The thermal spray industry experienced difficult economic times over the last two years. As a result, divestitures, acquisitions, and restructuring dominated the business agenda of many companies. The shift in competitive structure is enormous, and it is not yet clear how the rules for doing business will be influenced. It is obvious that change is the topic of the day, and it will affect all industry players. One important question arises out of the change. Does the thermal spray industry have the potential for future sustainable growth and profitability? Without recreating growth and profitability, the drive for renewal and innovation will be lost, and this industry will shrink with further restructuring and play a very inferior role in the technical and social development of our industrialized world.

The acquisition of Metco by Sulzer was done in the strong belief that this industry will have a successful future. But the future will be different from the past, and the way that we compete will be different. This is not because of industries consolidating; it is due to the fact that customers change their buying patterns, therefore leading the thermal spray industry into its mature state. Globalization of the major customer segments will have a significant impact, and only truly globally acting companies will survive in the long term. In nature as well as in social systems, its parts or elements follow a very similar growth pattern, reflecting three stages shown as an S-curve in Fig. 1. For each of these phases, different rules and behavior patterns apply; thereby dictating strongly the behavior of the system. See Table 1. In between these stages, breakpoints lead to real change.

The thermal spray industry follows a similar pattern and is at the breakpoint between phases 2 and 3 (Fig. 2). It has to begin to do things differently and do different things!

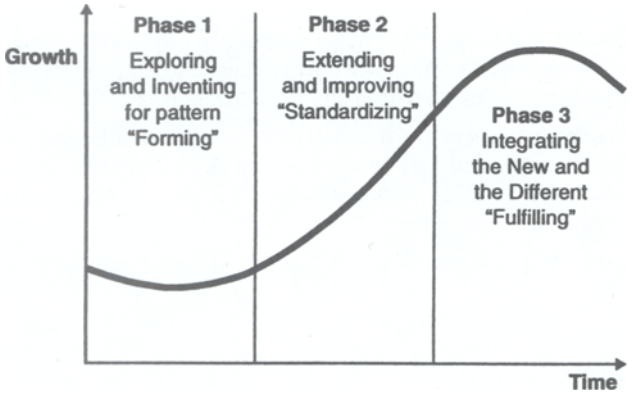

Fig. 1 Cycle of change

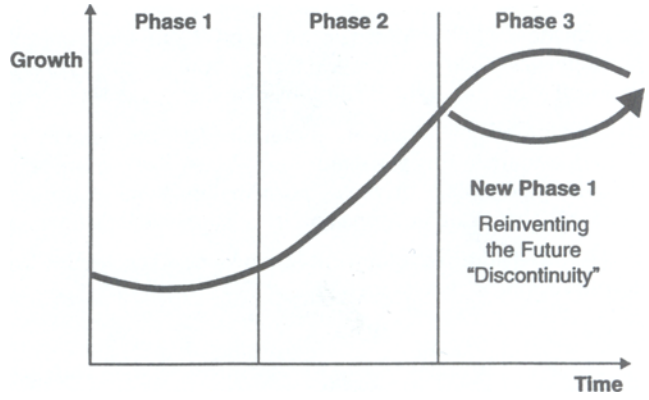

Fig. 2 Cycle of change (2)

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Table 1 Description of the various phases of technological changes

Phase 1	Phase 2	Phase 3
Entrepreneurial	Management	Shared leadership
Divergent	Duplication	Divergence and innovation
Inventive	Modification	Sharing and integrating differences
Creative	Improvement	Partnering
Exploratory	Commonality, likeness	Vision
Do it. Try it. Fix it!	When you find something that works, stick with it!	Begin doing things differently and doing different things!

Historical Appreciation

Thermal spraying goes back to 1909 when Max Ulrich Schoop in Switzerland patented various methods for producing coatings. His inventions and those of many others who followed him have continued to push forward the technologies that we are using today and probably will use in the future. From those beginnings, we have seen the buildup of processes, such as arc wire, flame spraying for powder and wire, high velocity fuel spraying, and plasma spraying in ambient surroundings and at different pressures. The technical features and benefits of these processes have been demonstrated to and recognized by many industries that today would not be successful without thermal sprayed surface coatings. Enhanced performance, durability, and lifetime have resulted, making many technical products more efficient. The real growth of thermal spray applications began after World War II, especially with the development of gas turbines. In this phase, many inventions were developed leading to rapid growth. A typical phase 2 was between 1980 and 1992 when new groups formed, repeated the pattern, and extended and improved the industry.

In the consideration between technological push and market pull, it has predominantly been the search for a solution to a surface problem (corrosion, wear, etc.) that has expanded the business. At the present, a more realistic direction would be to question if it is of greater benefit to principally discuss engineering the surface and to expand markets and new technical solutions based on this idea.

Events in 1994

Two important events characterize the year 1994 in the thermal spray industry: the acquisition of Hobart Tafa by Castolin Eutectic and the acquisition of the Metco Division of the Perkin Elmer Corporation by the Sulzer Corporation.

Commencing in 1985, Sulzer has been following a long-term materials strategy, which saw the takeover of Plasma-Technik AG in Switzerland (PT equipment) and its associated companies worldwide. This was followed by the takeover of Alloy Metals (Amdry powders for thermal spraying and brazing) and Electro-Plasma Inc., known for low-pressure plasma sprayed (LPPS) equipment. In 1993, the opportunity arose for the acquisition of the Metco division of the Perkin Elmer Corporation, and finally at the beginning of October 1994, after clearance of all governmental requirements, Sulzer Metco commenced operations worldwide. At this time, the Sulzer Metco organization consists of 22 companies in 17 countries with one global marketing and sales group and manufacturing groups for equipment and materials, respectively. The Sulzer Metco product group of Sulzer is unique in that it offers all of the thermal spray materials and processes.

Customer Requirements

The formation of Sulzer Metco from a variety of different companies with different product types, market segments, and cultures required an orientation that could be effective if it came from our customers. To be guided in a neutral way, an independent consultancy house was commissioned with a survey of our customers so that Sulzer Metco could proceed in the right direction from the very beginning.

A few results of this review are summarized as follows. The supply of coating equipment and materials represents one of the critical issues in manufacturing parts and components. The coating process is a key determinant of the quality of our customers' product. There is a trend in technology driven decision making to purchasing (cost) driven decision making. A very important factor lies in the quality of service. The availability and quality of supply and technical support has high priority.

The value of coating development (brainware) is specifically asked for by the OEM customers who are going for the next technological step or breakthrough with their product.

Industry Structure

The present times can be characterized by "industry restructuring and consolidation." Political events, such as the fall of the Iron Curtain, the Gulf War, the failure of the Soviet Union, and the current problems of Russia, have a big economic impact and are influencing our industry. The formation of huge economic regions leads to more deregulation resulting in additional dramatic changes. The most recent example having impact is the failure of airlines to generate profits, thus increasing pressure on our situation. Capital investment

as well as operating costs are now closely controlled, leading to a reduction in coating volume and an increased price war. Those companies depending heavily on the aircraft industry are significantly impacted, and capacities are still being adjusted. Further, product lines previously protected by patents become available to the general market, resulting in an increase of production capacity and therefore reducing margins to even lower levels than purely economic reasons would command!

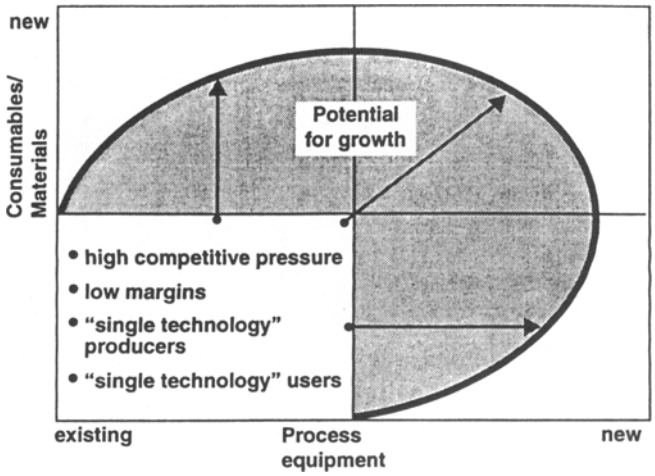

Fig. 3 Development dilemma of the TS coating industry

An important factor for reduced profitability and growth for the equipment or consumables manufacturer comes from the fact that coating application development is driven more and more by the coating producer. The coating producer is mainly using existing equipment and materials (see Fig. 3). In only selective cases does he want to get new materials, and in very few cases, would he like to have new equipment. If he has a solution, he tries to keep it exclusively. One of the interesting examples for this pattern is the Praxair D-gun process. Only when volume and profits of an application cross certain limits do industrial and technological competition begin the search for alternatives as happened with the introduction of modern high velocity oxygen fuel (HVOF) technologies. Expansion into the new innovative fields in the "consumables-process equipment" diagram is therefore delayed, slowing down the true expansion potential of the industry (Fig. 3). In addition, pioneers usually have problems in getting their ideas accepted. Jet-Kote, an example of HVOF, was a door opener, but it has never become the big volume/profit producer.

On the other hand, every user of thermal spray technologies expects the equipment and/or materials manufacturer to expand the scope of this industry. Being trapped in the existing/existing market of Fig. 3 leads to high price pressure, and the margins no longer allow the financing of the technological expansion resulting in the following business dilemma. How can we expand existing industries or open up new industries for the use of thermal spray coatings? The more we investigate this question the more we come to the conclusion that a strong push is necessary to establish thermal spraying in the same way, for example, that a coating for aluminum protection is selected. This means existing technologies are standardized to the point that an engineer can select a standard coating and get a certified shop to produce it. In order to do this, professional leadership is needed from societies that consider themselves the guardians of thermal spraying. Unfortunately, at the moment, there is little harmony and progress to be seen along this line.

Doing Business Now and in the Future

The real expansion and growth of our industry can take off again only when the value added chain becomes deregulated. Let me explain. Our business can be described in simplistic terms in the following way. Today the thermal spray industry has a clear opinion about the division of tasks.

A coating is developed, the accumulated knowledge/experience is spent, the equipment and materials are available, and OEM's or coating shops do the production (Fig. 4, 5). The equipment and materials manufacturer is expected to contribute his accumulated knowledge/experience for free and to deliver hardware and consumables at very competitive prices, leaving no margin for further development. He is not allowed to ask a premium for his innovation or any compensation for his quest in expanding applications. In addition, standard consumables can be produced by small companies with low overheads, again increasing pressure on gross margins!

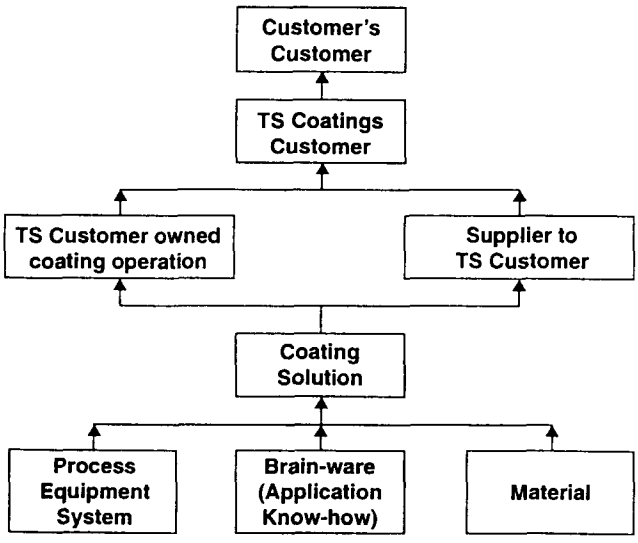

Fig. 4 TS coating industry: business process

In a high volume and repetitive business, that approach might work for a while, but our thermal spray (TS) coating industry is small in many respects. The total global volume is about 150 million dollars for equipment and about 250 million dollars for consumables. If every supplier contributes about 5% to research and development, the total available 20 million dollars does not offer the breakthrough potential for this technology field. Considering the fact that many players are in this segmented field, the chance for real advancement is really very low.

The breakthroughs have to be pulled by the coating and its use. To become successful, the users, producers, and suppliers of coatings have to create a cooperative scenario, allowing everybody to participate and to return enough profit to reinvest into growth. In

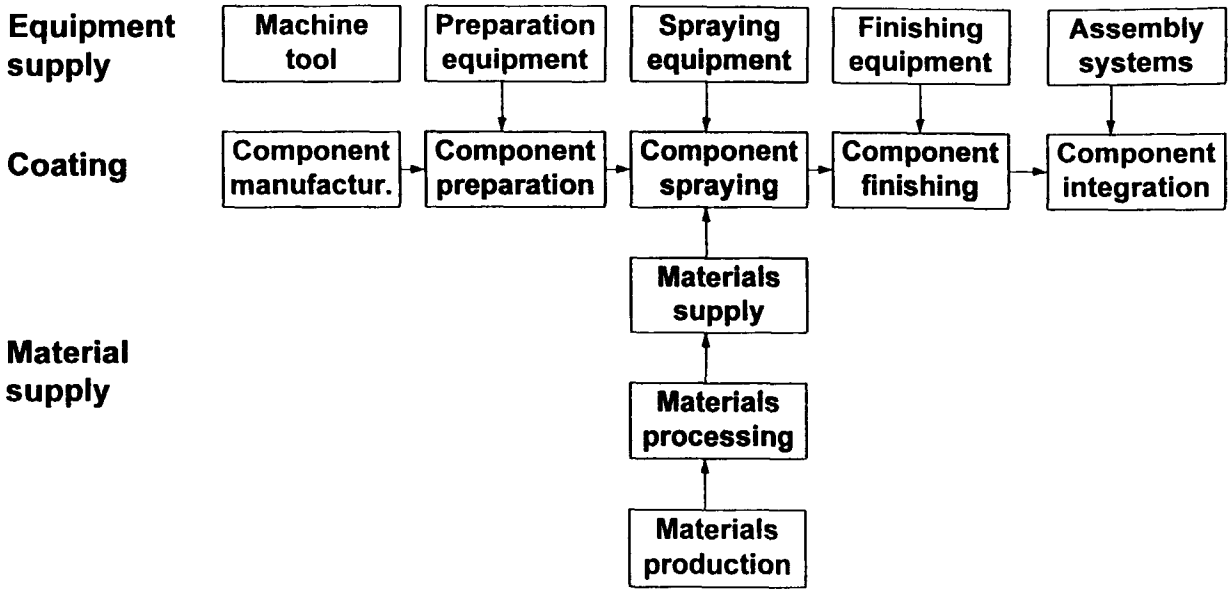

Fig. 5 Knowing our industry

many industries, customers and vendors become partners, suppliers, or competitors simultaneously, leading to an increase of the energy necessary to become creative and innovative again. Innovation is not restricted to technology. It can be in financial, organizational, social, and environmental activities, leading to new and exciting ways for success.

The Value of TQM and Environmental Considerations

The way Sulzer Metco is doing business is guided by customer requirements on one side and Sulzer policy rules on the other. Among these are the topics of total quality management (TQM) and environmental considerations. Both represent a commitment by Sulzer to all of our Sulzer Metco customers that our work will be carried out according to TQM principles. We all appreciate that this is a time-consuming process, and we are convinced that the cultural change that will come about will benefit our customers in all we do. At the same time, we are examining our products with regard to environmental considerations. This is not just a question of getting rid of the overspray from the process. It is more an analysis and understanding of all the steps in the processes we use to make and sell our materials and equipment together with the way our products are used by our customers. This form of total life cycle consideration will have a significant impact on the research and development directions that we select in the future.

Summary

The thermal spray industry is in a transition phase. Different acquisitions and mergers as well as cooperative schemes will affect the way our future business pattern will evolve. Competing and forming alliances at the same time could offer growth by expanding local coating solutions into global coating know-how. For this change to occur, a change in our thinking and open and fair business rules have to be developed, allowing enough return to expand the technology base and satisfy our shareholders. Only in this way will we be able to offer long-term positions for motivated coworkers, deliver customer attractive products, and have an acceptable return on investment to attract new investors.

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