

History

The origin of thermal spray dates back to the early 1900s. The invention of a metalizing process by Schoop is generally accepted as the date of the technology birth. Initially, the process had been used mainly for deposition of corrosion resistant zinc coatings, followed later by the spraying of hard metals. During the 1950s the broad applications of new refractory materials started and new techniques of thermal spraying such as, for example, the D-Gun. The studies of physical backgrounds in spraying process were initiated in the 1960s. The 1970s witnessed the development of vacuum plasma spraying, credited to Muehlberger. Finally, during the last decade, thermal spraying technology became a widely recognized industrial technology. The development of the high velocity oxy-fuel technique by the Browning Engineering Corp. is another achievement. Equally active was the research on new materials and on the new applications. The accessibility of such modern optic devices as LDV (Laser Doppler Velocimetry) or two-colour fast pyrometry enabled advanced studies on the physical fundamentals of the spraying process to be carried out, especially investigations of heat and momentum transfer between flame and the sprayed particles. Cold spray is the newest of the thermal spray processes and is mainly found in research labs at this stage of the technology's development. Dr Antolli Papyrin and colleagues at the Russian Academy of Sciences were the first to demonstrate this process in the mid-1980s. And similar in principle to the other thermal spray methods, it follows the trend of increasing particle spray velocity and reducing particle temperature as with the HVOF/HVAF processes, but to a more extreme level that it could be asked whether the process fits under the description of thermal spray.

The future development of the technology is related to the economic requirements of the thermal spraying market. An analysis of this market in the USA, carried out by the Gorham Institute, shows that the total value of the market in 1990 in the USA is about 610-675 US\$/year and is expected to grow to 1800-2000 US\$/year by the year 2000. Even if this growth will be less spectacular, due to the present recession, it is still very impressive, especially if one takes into account other dynamic economies. This growth could mainly be attributed to new applications which have already been used in prototypes or in a small series of products. The known techniques will be further improved by making the spraying process more repetitive, more user and especially environment-friendly and less expensive. Finally, the advanced coatings resulting from the deposition of composite powders, from the application of the reinforcements with fiber, whiskers or particles are expected to be widely applied.