



Joint Venture Business and Plasma Jet Technology

Plasma Jet Co is private company in Serbia & Monte Negro founded in 1999 primarily to commercialize an original DC arc plasma torch design superior, by all important plasma generating performances, to other plasma torches existing on the market.

The company has been exclusively committed to R & D of DC Arc Plasma potentiality for industrial applications. Although with a modest financial capability, the company succeeded, through a mutually beneficial collaboration with the Vinca Institute for Materials, to develop and apply high tech PJ-100 installation for plasma coating.

Plasma Jet Co is capable of delivering to customers the following services:

- Commercial service for restoration of worn machine parts and enhancement of their engineering properties¹
- Construction of DC plasma coating equipment based on an original hot cathode plasma gun design², adaptable to requirements and needs of more sophisticated users.
- R & D in the area of plasma coating for the new substrate – coating systems; especially those that include: cermets, composite materials, oxides and non-oxide ceramics.
- R & D in the area of plasma forming for the manufacturing of machine parts of complex forms by successive coating of high melting alloys, cermets, composite materials, oxide and non-oxide ceramic materials.
- R & D in areas of materials chemical processing, initiated and facilitated by DC - arc plasma; for instance Chemical Vapor Deposition (CVD) of synthetic diamond³.

What makes the PJ -100 installation unique, in comparison to other existing plasma spraying installations, is the increased plasma power of a longer and uniform plasma plume⁴. These characteristics jointly provide: better quality of coatings (i), shorter coating time (ii) and, lower coating cost (iii).

¹ Application of DC-Arc Plasma Jet Technology, August 2004.

² PJ-100 Plasma Gun - Plasma Spray Coating, *Plasma Jet Co*, August 2004.

³ Development of Installation for Diamond Synthesis by DC-Arc Plasma CVD Process, *Plasma Jet Co* August 2004.

⁴ Sulzer-METCO, TAFE and Westinghouse versus Plasma Jet Gun – What potentiality others do not



Additional vital outcome of the PJ -100 gun's unique design is that it allows further power increase of the plasma torch up to 300kW, without any serious technical and engineering problems. No other of existing plasma torch design concepts offers such a possibility, and it is an essence that makes the PJ - 100 gun design unique. The ultimate result of the originally designed PJ -100 hot cathode is that a much longer and uniform plasma plume exits the anode opening. It is twice longer than in conventional Sulzer -METCO design, mainly as the result of the higher exiting plasma speed.

Both higher plasma speed and longer plasma plume are conducive to higher heat and momentum transfer from plasma to particles of spraying material. In turn, these two characteristics of PJ – 100 plasma plume produce better quality of coatings; lesser percentage of non-melted particles, lower porosity and higher adhesion to a substrate material than coatings made by any other plasma torch⁵.

The hard wear resistant ceramic coatings on carbon fiber/epoxy resin composite is a challenging application in a rather broad area of immediate industrial usages of the PJ -100 installation. Rollers in paper and printing industry, made from carbon fiber/epoxy resin composite, are two examples of machine parts which wear and abrasion properties can be enhanced by plasma spray coatings¹. The **Plasma Jet Co** successfully tested four different hard coating materials on these rollers. They are Co/WC and Cu + Fe/ WC composite, and Al₂O₃ and Cr₂O₃ on the ANILLOX rollers.

For the projected portfolio of service providing business to a new customers market it is essential that the company possesses the unique powerful machine, which flexibly provides (with one machine) the coating capabilities of several different thermal spraying machines in use today: HVOF, HVAF, flame and DC-arc plasma.

The presence of the nourishing R&D activities, originated with the company foundation is the central feature of the **Plasma Jet Co** development strategy. With an appreciable element of novelty the company is able to enhance the problem resolution ability of manufacturing engineering industrial sectors. That is, when the solution to a problem is not readily apparent to someone familiar with the basic stock of knowledge and techniques commonly used in the material engineering area. It happens in:

- Tooling-up of industrial machine engineering and manufacturing industry for the minor product or process modifications,
- Pre-production development of new services and products with the commercial trial

have? *Plasma Jet Co*, September 2004.

⁵ Report of Testing the Performances of *Plasma Jet – PJ-100* in Plasma Spray Coating Installation, Vinca, February 2002.



- Marketing of advanced services and new products; adaptation of the products for different markets is included.
- Acquisition of disembodied or embodied technologies linked to innovations introduced by the **Plasma Jet Co**, such as patents, non-patented inventions, and licenses, disclosure of know-how, and machinery and equipment servicing.

The experience and expertise knowledge in the industrial and materials conceptual design possessed by **Plasma Jet** people would help the JVB to be quicker and innovative in response to industrial engineering needs both in restorative/reparative coatings and in acquisition and implementation of new design concepts. Such an ability and responsiveness to the ever changing industrial needs is not usually possessed by other suppliers of plasma coating services that are much dependent on giant producers of plasma spraying installation who, also, prescribe technological solutions for the use of their machines.