27/41

Solidification of Metals and Alloys,
Year 1999, Volume 1, Book No. 41
Krzepnięcie Metali i Stopów,
Rok 1999, Rocznik 1, Nr 41
PAN – Katowice PL ISSN 0208-9386

PNEUMATIC CAST IRON CARBURIZING IN WSK „PZL-RZESZÓW" S.A.

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SUMMARY

Metal bath carburizing in metallurgical furnace by blowing powders lets achieve high speed of that process and its great efficiency. That provides considerable economical profits and enables for a precise carbon content's corrections in a very short time. These corrections help do decrease pig iron's contribution in charge, which also reduces costs of production. Nowadays in Poland work between ten to twenty stands, which put this process into practice. They are entirely polish solutions, gained due to collaboration of POLKO Co-operation from Mikołów and Chair of Foundry, Silesian Technical University from Gliwice. These systems may be equipped with programmable industrial controllers, which will automatize whole process (loading of material, weighing, proportioning). Application of shown technologies enables devices' shock absorption within few months.

INTRODUCTION

Since many years the blowing of powdered materials into a liquid metal has been known technology. Comminuted reacting substance permits a large contact surface of the reacting phases (powder-liquid metal) to be obtained. In addition, the carrying gas forces a motion of liquid metal to homogenise its chemical composition through the whole volume. These factors cause that metallurgical processes being run (such as carburizing, desulfurization, introduction of alloy additions) are characterised by a large chemical reaction rate and a very high degree of the assimilation of particular elements by liquid metal.

When cast iron heating in electric arc furnaces, one of the problems is to obtain an adequate carbon content in liquid metal. It is a very essential question at many modern foundries that sensibly an economically approach the production run, and which have resigned the pig iron in charge due to its high cost. It also occurred at WSK "PZL-Rzeszów" Iron Foundry and Cast Steel S.A.

An attempt is made to correct the carbon deficiency formed in this way. By conventional methods (adding an carbonising agent into charge and subsequent complement at the final heat stage, by throwing on the surface). However, these methods are time-consuming and not enough effective, that significantly elongate time of heat. Thus a need for other effective solution has been resulted and such method of air-operated carburizing of liquid metal is being occurred.

STAND OF AIR-OPERATED CARBURIZING

A device for carbonising metal bath has been produced and set in motion by Mikołów POLKO CO-OPERATION, with participation of Foundry Practice Department of Silesian Technical University in 1998. The main member of the device is a pressure tank 1 (fig. 1) of 0,25 m^3 volume. This volume altogether ensures that adequate material batch is proportioned and enables its amplification. A bell seal is situated at the upper portion of the tank, and a mixing chamber 3 below. On the tank, a venting valve is mounted for pressure relief of the tank after the termination of each working cycle.

Air pressure supplied to the tank is controlled by a reducer 4. A master valve 16 makes is possible to supply or cut off the air supply. The valves (master 16, venting 17, bell closure and opening of mixing chamber) are electrically started from the tank control panel 2. The tank is founded on a strain gauge scales 5, the indications of which are displayed on the control panel 2.

In its initial position, the balance indicates a mass of material contained in the tank (net). At the moment of starting the haulage cycle, it shows a quantity of material which has been introduced into liquid metal. Switching off the haulage causes displaying the mass left in the device. It is very comfortable for the operators. Carbonising agent is displaced by a transport pipe 7, terminated in a lance that is introduced into an arc furnace 9. The lance was placed on a manipulator so that it should be introduced into liquid metal. It must be pointed out that the manipulator has been designed and performed by the foundry workers. Its fundamental element is a protective screen with mounted rollers for moving and supporting the lance, and shifting along the guide bars. It facilitates the service thus eliminating physical effort, and at the same time, providing safety and greater process repeatability. Over the device, there is a storage tank 10 of 1 m^3 for carburizing material. A screen 11 is placed at the tank top to catch oversize particles and impurities that may be contained in carbonising agent.

The bottom part of the tank 10 is a crevice damper 12, driven by a pneumatic servo-motor and controlled from the table 2. Between the storage tank 10 and the chamber feeder 1 there is a rubber compensator 13 to eliminate the interaction of the former on the weighing system. In the part of feeding the compressed air system the cut-off valve of medium supply to the device 15 is installed. Considering bad quality of compressed air at the plant network 14, it was a necessity to mount an air filter 18 to eliminate water and oil impurities. The carburizing material is delivered by producers in big-bags of 1 m^3, to be unloaded into the storage tank by means of a crane.

CONCLUSION

The operating life of the device for carburizing metal bath through a pneumatic method under conditions of WSK "PZL-RZESZÓW". in foundry and Cast Steel has completely confirmed the suitability of this technology and the device system used for its realisation. Very large carburizing rates have been obtained, and the effectiveness of carbon use increased several times in comparison with conventional methods. The starting run has shown the importance of collaboration of persons and units that accomplish the subject at the initial stage of implementation.

In this case, it turned out excellently, which is evidenced by a proposal and manufacture of the lance manipulator, assistance in the system assembly, and hospitality.

The implementing party (Co-operation POLKO and Foundry Department of Silesian technical University) wishes to tank the Management of Foundry WSK "PZL-RZESZÓW" S.A. for such good co-operation. Only such approach assures effective introducing the new solutions into industrial practice.