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ATTENDANCE AT THE 34TH ELECTRIC FURNACE CONFERENCE IN ST. LOUIS, MISSOURI, DECEMBER 7-10, 1976.

BY

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This conference was held at the Chase Park Plaza Hotel in St. Louis, Missouri and was sponsored by the Iron and Steel Society of A.I.M.E. The preliminary program is outlined in the Iron and Steelmaker Journal, volume 3, No. 11, 1976. The conference was divided into three general basic groups: (1) Ingot Group, (2) Special Arcs Group and (3) Castings Group which were held in three simultaneous sessions.

In the opening joint session, T.C. Gaines, vice-president, Manufacturers Hanover Trust Company, outlined the economic prospects for the United States in the coming year. He pointed out that there was a 100% increase in housing starts in the U.S. in the past four months and there was expected to be about a 100% increase in auto production this year over what it was 2 years ago. Heavy construction was down in the past month and he expects it will remain so. A long period of high unemployment is ahead, but inflation is down from 14 to 4%

over the past year. An inflation rate of 2 to 3% is predicted for next year (1977). The gross national production has increased more than 5% over last year and is expected to be about 4 1/2 to 5% average for the whole year (1976). The long term interest rates are down from 9% to 6% with the short term interest rates expecting to increase. Generally the overall economic prospects look good, but short of excellant. B. Gold, professor, Case Western Reserve University, Cleveland, Ohio, stated that the large electric arc furnaces being developed by the Japanese are not necessarily economic and only with the superior labour efficiency prevalent in Japan can these large electric arc furnaces be expected to reach their fully rated steel production. J.M. Schaum, Publisher and Editor of Modern Castings, reviewed the outlook for steel foundries. He expected that business for foundries would increase about 7% in 1977 and estimated that a billion dollars a year would be invested in capital expenditures for foundries over the next ten years. Presently about 25 to 30% of the foundry business is related to the auto industry and General Motors assured Mr. Schaum that the auto industry would be using less aluminum and more steel to produce engine blocks in the future. At present, three types of melting furnaces are used in the U.S. Foundries. About 70% of the melted stock is produced in cupola furnaces, 20% in induction furnaces and 10% in electric arc furnaces. The cupola furnace is still the workhorse of the foundry, but because of an expected shortage of coke (4.8 million tons will be required by 1985 as

compared to the 3.5 million tons of present annual consumption), some of the cupola capacity will gradually be replaced by electric melting. Discussions from the floor indicated a general agreement with the optimistic outlook of the speakers and no concern was voiced about the air pollution standards for coke ovens which are to take effect in January, 1977 and to be met by 1980.

Preprints of some of the papers presented in the three general sessions were available. These preprints included all of those papers which were available for publication at the time of the conference. Those papers, not included in the preprints, will appear in volume 34 of the "Electric Furnace Proceedings".

In his paper, "Installation of Sealed Covers for Fume Control on Submerged Arc Furnaces", D.T. Bailey pointed out that lower power consumption and higher silicon recovery has resulted from the installation of this equipment on their two electric arc furnaces in Keokuck, Iowa. Mr. Peters, who presented the paper on the "Construction of 67.5 MVA Silicon Furnace Plant", stated that the use of the analog computer to verify the safety of the electrical design of the plant has proven to be a profitable and time-saving innovation. It is expected that the final cost of this plant will be less than was budgeted, with a cost split of 24% for air pollution equipment, 34% for smelting equipment and the remaining 42% for the casting bay, raw materials handling, plant services, site work and batching bay. J. Baker, in his

paper on the "Production of Low Carbon Silicomanganese from Standard Manganese Fines", stressed the fact that the furnace operating crew (specifically the furnace tappers) had a great influence over the operating efficiency of the furnace. Control of the furnace operations was rapidly lost due to overcoking when the furnace tappers did not remove a specified amount of coke with each tap. In spite of the difficulties encountered in process control, it was determined that the production of low carbon silicomanganese from standard ferromanganese fines is a feasible process. Mr. D. Donis in his paper on the "Effect of Prior Oxidation of Loose Turnings and Borings in Arc Furnace Melting", refers to experiences reported in the literature wherein turnings and borings have been remelted in cupola furnaces by adding them loose to the charge, by powder cans, by briquetting or by injection through the tuyeres, but little information has been published on the remelting of these materials in arc furnaces. More than nine years has been expended on exploring an efficient means of remelting these materials. Turnings, which are stored in the open atmosphere, will oxidize to a maximum of about 10%, while borings oxidize to a maximum of about 20%, probably due to a thin oil coating and the lower surface area of the turnings compared to the borings. Oxide contents of the various samples were determined in a single electrode arc welding machine, under an argon atmosphere. Using this equipment, a 50g sample was melted in 30 to 40 seconds to produce a slag button and a metallic iron button and the extent

of oxidation in the original sample was determined by weighing the two products. This paper concluded that the increase in arc furnace energy input necessary to reduce iron oxide (Fe_3O_4) present in borings and turnings can be calculated using the following formula, with the practical base level established for melting non-oxidized gray iron being 530 KWh/metric ton: KWh/metric ton (increase)= 2240 (% borings or turnings) times (% oxide content).

N.B. Luther in his paper on "Melting Experience Using Borings at Pontiac Motors Division", stated that 10 to 12% oil in this material in a furnace charge, containing close to 50% borings, burned out the bag house. Charges, containing 30 to 42% borings produced 20 to 34 lb of dust per ton of steel and they are presently using about 25% borings in their furnace charges.

W.E. Kamradt presented a paper entitled "Semi-Continuous Charging of Direct Arc Furnaces with Loose Cast Iron Borings". In this paper Mr. Kamradt outlined the operation of their electric arc furnaces, which were constructed in 1949 to melt a charge of loose borings and turnings. This material was first charged through the roofs of their furnaces but later a pneumatic charging device was developed, which charges the loose material through the furnace charge doors from a 1500 pound charge hopper. Charges of 1500 pounds are a made into each furnace five times per hour. It requires about 14 piston strokes to discharge 1500 pounds of borings. Each furnace operates on a two shift operating pattern, idling during the non-operating shift, and is drained at the end of each week.

The furnaces are slagged three times per day, discharging a slag containing approximately 30% SiO_2, 36% Al_2O_3 and less than 27% FeO. Voluminous smoke emissions, which are produced from the furnace during the short charging period, are collected in three bag house type dust collector units, each rated at 55,000 CFM. The baghouse temperature is not allowed to rise above 260°F. W.W. Thomas presented a paper on the "Practical Aspects of Melting Borings to Produce Gray Iron Castings". In this paper Mr. Thomas outlines the history of their melting operation from 1890 to the present date. In 1971, for economic reasons, the conventional acid lined cupola operation was replaced with a direct arc melting, channel induction, holding furnace operation. This operation, using about 10% borings in the furnace charge, ran quite smoothly. In 1973, due to high scrap prices, the borings consumption was increased to greater than 30% of the furnace charge. This resulted in malfunctions and serious inefficiency in the baghouse equipment and in 1974 the borings consumption was reduced to the previous 10% level. It was determined that the high oil content of the borings was the cause of the malfunctioning baghouse. When the baghouse was cleaned out and rebuilt, the percent of borings in the furnace charge was gradually increased, but with the specification that the borings would contain no more than 1% combined oil and moisture. This specification has allowed a practical operating level of 30% dry borings in the furnace charge, so long as the baghouse equipment is properly maintained. In

order to maintain a reliable source of these quality borings, the plant is considering the purchase of a "chip dryer" facility. A panel discussion on the use of "Split Shells for Electric Furnaces" indicated that this was a practical method for reducing the cost of refractories. Savings as high as 35% have been reported.

In summary, the general feeling of the sessions I was able to attend at this meeting indicated an optimistic outlook for the future of electric arc melting furnaces in the steel industry. Air-pollution abatement requirements have meant an added cost to foundry production, but the problems associated with these requirements are gradually being solved and furnace efficiencies increased through the use of innovative techniques. Some of these innovations (at least innovative to myself), such as the injection of recycled oxide wastes through the tuyeres of a cupola and the pneumatic charging of recycled waste products to electric arc furnaces, have become semi-standard practice. Unfortunately it was impossible for one person to attend more than one session at a conference where three sessions are being held simultaneously. Hence, any information regarding the other sessions will have to be based on data published in the final edited papers.