SUMMARIES

González R., Barbés M.A., Verdeja L.F., Ruiz-Bustinza I., Mochón J., Duarte M.R., Karbowniczek M., Migas P.:

Mechanisms Knowledge of the Flow and Wear in the Blast Furnace Crucible with the Nodal Wear Model

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The presence of thermocouples in the lining of crucibles has become a general practice in the new construction of blast furnaces. The Nodal Wear Model (NWM) has also emerged as an instrument that, while using experimental data, obtains nodal variables whose experimental measurement is not possible: global coefficient of pig-iron/refractory heat transfer $h_{g-i}^{pig-iron/lining}$ and nodal temperature T_i. Starting from these nodal properties, the wear of the lining or the growth of scabs may be controlled, independently of the mechanisms responsible for them. In the same way, the properties and influence zone of the dead man in the hearth of the blast furnace may be calculated, along with those regions where the fluid is allowed to move without any other restrictions than the ones of the corresponding viscous flow (raceway hearth region).

Keywords: *blast furnace, hearth, wear, dead man*

Barbés Fernández M.F., Marinas García E., Verdeja González L.F., García Carcedo F., Ruiz-Bustinza I., Karbowniczek M., Migas P.:

New BOF Slags Containing Sodium and Manganese

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The nature and properties of slag and dust generated during the manufacture of pig iron indicate the two possibilities of their utilization: sintering or cold agglomerating with Portland cement. Both sinter and pellets can be recycled in the LD converter. It was introduced the concept of "preformed synthetic slag" to use the recycling of waste. If the material contains components forming the eutectic properties similar to sinter or pellet (obtained outside the converter) it stimulates the creation of slag in the LD converter.The aim of this research is to address the best way to deal with manganese before the molten metal reaches the final stage of temperature and composition for casting. Ideally, the composition of the slag and dust produced by the BOF-LD can be adjusted so that the molten metal that reaches the secondary metallurgy contains over 1.0% manganese.

Keywords: *BOF, slag, sodium, manganese*

Cwudziński A., Jowsa A.:

Numerical Modelling of Non-metallic Inclusions Size Distribution during Liquid Steel Flow through a Continuous Casting Slab Tundish

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The article presents the results of computer simulations of non-metallic inclusions behaviour in a slab tundish. The tundish is equipped with a dam with two holes. The authors employed the CFD

(Computational Fluid Dynamics) numerical modeling technique to demonstrate changing process of non-metallic inclusions size distribution. The computer simulations were performed for non-isothermal and non-steady conditions of continuous steel casting process. As a result of computations, time characteristics of changing volume fraction for particular group of non-metallic inclusions were obtained.

Keywords: *tundish, non-metallic inclusions (NMI), size distribution of NMI, numerical modeling, population balance model*

Chyła P., Łukaszek-Sołek A., Bednarek S., Chyła P.:

Closed Die Forging of Turbine Disc to Fix Blades from Inconel®718

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In the paper numerical analysis of closed-die forging process of turbine disc to fix blades was presented. Forging technologies which take into account conventional and isothermal boundary conditions were analysed. Forging processes were lead as one stage or as two stages – with initial upsetting. In the analysis additional influence of lubrication conditions on the process parameters was taken into account.

Keywords: *turbine disc, closed die forging, Inconel®718, numerical modelling*

Karczewski K.:

Simplified Method of Heat Calculations of Oil-Air Heat Exchangers

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On an experimental post exploiting parameters of oil-air heat exchanger, made of aluminium pipes, with cross-circular fines were identificated. Simplified method of calculations of oil-air heat exchangers was elaborated. The method includes: heat transfer ratio, mean temperature difference, finning ratio, over-all heat transfer coefficient, convective heat transfer coefficients on oil and air sides. The calculation results were compared with ones by Mean Temperature Difference method.

Keywords: *heat exchanger, heat transfer ratio, mean temperature difference, over-all heat-transfer coefficient, finning ratio*

Kamińska J., Skrzyński M.:

Physical, Chemical and Strength Properties of Dusts from the Bentonite Sands Treatment Plants

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The investigation results of the physical, chemical and strength properties of dusts from the bentonite sands treatment plants as well as from the reclamation processes of the analogous spent sands, are presented in the paper. The aim of investigations was the determination of preliminary conditions allowing to pelletising dusts in the bowl granulator. The verified examination methods were applied for testing such dust features as: specific density, bulk density of loosely built and of compacted materials as well as related to them porosity, ignition losses and chemical reaction (pH). The grain

composition of after reclamation dusts was measured by means of the laser diffraction analysis, allowing to significantly widening the grain size measuring range. The optimal wetting liquid content (in this case: water), at which the water-dust mixture has the best strength properties (R_c^w, R_c^s, R_p^w), was established. Examinations of the moisture content influence on the permeability, compactibility, flowability and friability of samples compacted by means of the standard moulder's rammer were also performed.

Keywords: *after reclamation dusts, granulation, water-dust mixture, strength properties*

Tęcza G., Sobula S.:

Inoculation-Induced Change in Carbides Content in the Columnar and Equiaxed Structure of Centrifugally Cast Tubes from 32Ni-25Cr-Nb Steel

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The properties of alloys used for centrifugally cast catalytic tubes depend on the stability of carbides hardening the alloy at an operating temperature. Tubes cast in centrifugal process are characterised by structure changing on the cross-section: the outer layer is composed of columnar crystals, while inner layer has the structure of equiaxed crystals. The properties of these two zones differ and have a major influence on the casting behaviour during operation. The aim of this study was to determine the volume fraction of Cr and Nb carbides in the zone of columnar and equiaxed crystals under different inoculation regimes. It was found that the type of the used microadditives changes the amount of carbides in the investigated zones of castings.

Keywords: *Ni-Cr-Nb austenitic cast steel, centrifugal casting, columnar and equiaxed structure, carbide precipitates*