

MELT SHOP PROCESS ISSUES AND RELIABLE IMPROVEMENTS

Auth: Bruno Zilli, Fabrizio Zilli, C.M.P. Officine meccaniche S.r.l., Via dell'Industria, 55-33030 Coseano (UD). E-mail: info@cmpofficinemeccaniche.it Web: <http://www.cmpofficinemeccaniche.it>

E.A.F. tap-to-tap time, energy saving, real time scheduling of operations, life of the slag door refractory layer bricks improving and workforce safety are probably important parts of the success keystones of an effective melt shop process. Every melt shop technician and all the people involved in the steel making process well know the issues that the E.A.F. slag process needs to be fulfilled to achieve an economically and metallurgically successful process.

The cold temperature normally experienced in the slag door area causes the not melted scrap presence in this zone for an important part of the process time. The E.A.F. slag door acts as an open window, that often cannot be closed completely before the scrap present on the inner sill will have finished to melt. By this open window represented by the door, a huge amount of cold air enters the E.A.F. furnace and heavily lower the furnace efficiency.



This cold scrap presence in the inner sill is prolonging the phase-on time to get the completed melted bath and the right metallurgical temperature. This extra time represents a dramatic increasing of the economic costs that cuts an important part of the final economic profit.

In the E.A.F. steel making process, the slag door geometry level from the bath is changing by the instant between two taping times. This is due to the natural flow of the slag from the steel bath, during the refining phase.

In this way, the operators that conduct the melting process must have serious problems to understand which is the right tilting angle, to avoid to pour steel in the slag bucket. In this scenario, the manual temperature and sampling operation becomes more critical, because the furnace position and the slag door level are changing.

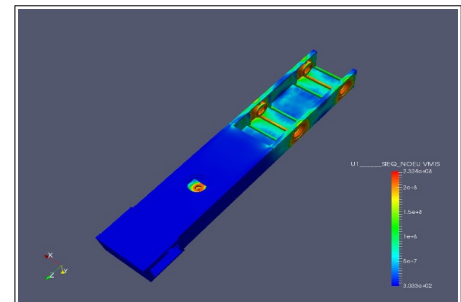
Due to the fact that the traditional managing operations lead to an unknown slag door level, as the productions and the number of taps is progressing, the slag door refractory layer bricks needs to be repaired by dolomite additions very often. This operation is conducted by a trolley or by handwork. This time has to be subtracted to the phase-on time, so this is time lost and increasing the costs of the production.

The E.A.F. slag door represents the easiest outlet for every exothermic reaction effect that happens inside the E.A.F. furnace. If the injected carbon powder or other reagent joint material experiences a sudden flash-over, the burning flames will be propagating outside the furnace by the slag door clearance. Often, this accident resulted in dead or seriously injured operators.

E.A.F. Scrap pusher and slag door cleaning robot complete with sampling manipulator produced by **C.M.P. Officine Meccaniche S.r.l** represents a reliable achievement of efficiency and safe working conditions in more of 20 steel plants worldwide. Keeping the E.A.F. slag door clean and taking samplings by remote control operations means a proven and undisputed gain in time and safety. A sturdy and simple design ensures simple maintenance operations and low operating costs.



The engineering design of the **E.A.F. Scrap pusher and slag door cleaning robot complete with sampling manipulator** has been improving by the years and by feedbacks from our worldwide clients. The product has been constantly tested by the field and by complex numerical simulations of the physical reality. The action of the pushing arm is explicitly designed for reaching the sill cleaned from the scrap and the slag level control, in the safest and most durable way.



The cleaning door operations from the unmelted scrap are conducted from a safe control pulpit far from the dangerous zone. Moreover, by the control of the slag level, the operator knows more precisely the right parameters (tilting angle, time for each melt shop process step) to easily conduct a reproducible melt process. The temperature and sampling operation can be performed by the **sampling manipulator**. In this way, every temperature and **CELOX sampling** can be more realistic and reliable. This is because the position of each sampling isn't changing by the time, and the level of the slag is the same too.



The adaptability and the simple and sturdy design of the **E.A.F. Scrap pusher and slag door cleaning robot complete with sampling manipulator**, allows every steel plant to be suitable for this application. In this way to operate, there is an average saving of 1-2 minutes every 50 minutes tap-to-tap time. This saved time represent an indispensable advantage to be implemented in every modern melt shop.

