

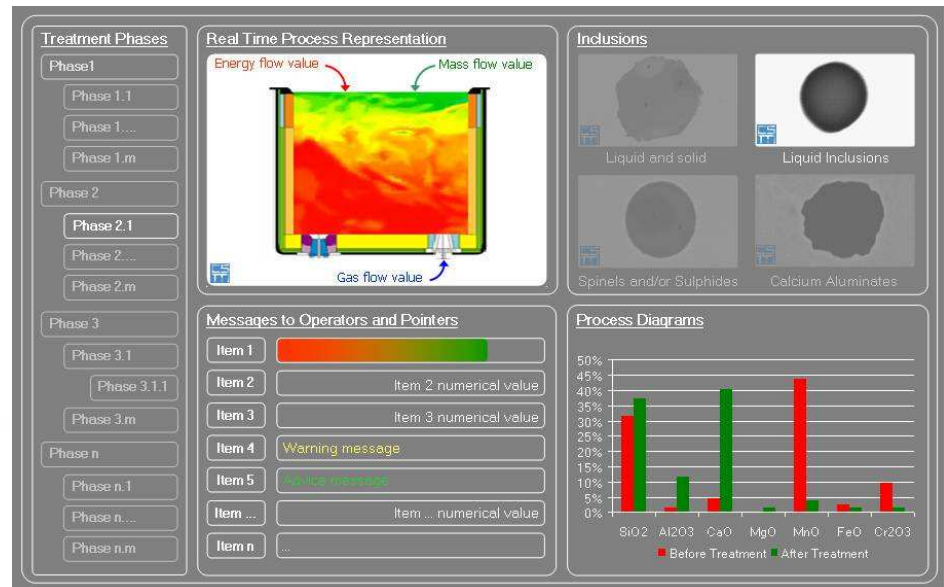


inclusionView

Problem:

During steelmaking, undesired oxide inclusions can be entrapped in solidifying steel and transform into defects during rolling.

To take decision about actions to modify the inclusion to reduce their harmfulness or to favour their removal it is essential a tool to monitor inclusion scenario during ladle treatment.



Solution:

inclusionView is a sophisticated virtual sensor for the prediction of mass and composition of inclusions starting from steel composition.

inclusionView can be run in a single shot starting from punctual analytical composition and temperature of steel or it can be run in continuous, taking into account continuous parameters such as added material flow rate or stirring gas flow rate.

The calculated information can be supplied to the operators in different forms, at different level of complexity.

inclusionView can be used for control purpose.

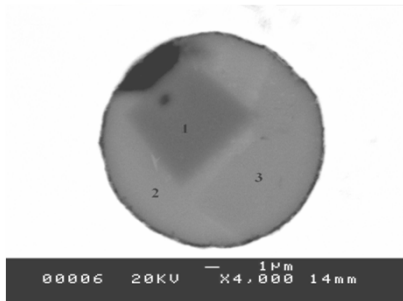
It supplies quantitative information about the correct amount of material to be added (e.g. CaSi wire) for the obtainment of target composition of inclusions.

Benefits:

- Decreasing of inclusion content
- Reducing flow control problem (build up, SEN corrosion)
- Steel grade tailored refining operating practices
- Improved knowledge on ladle refining process

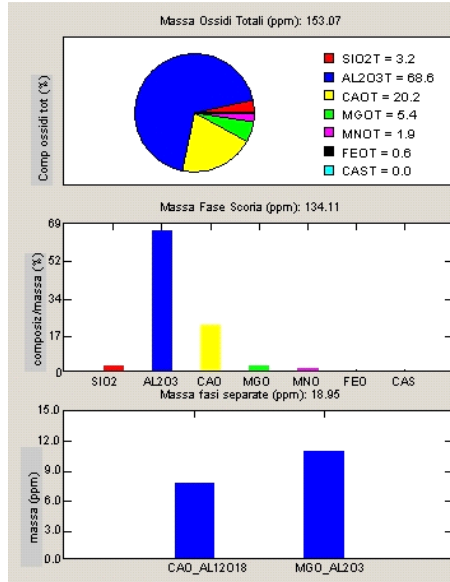
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Together with numerical and graphical output *inclusionView* supplies indications about the probable type of inclusions retrieving information from a database of electronic microscopy investigations on real steel samples



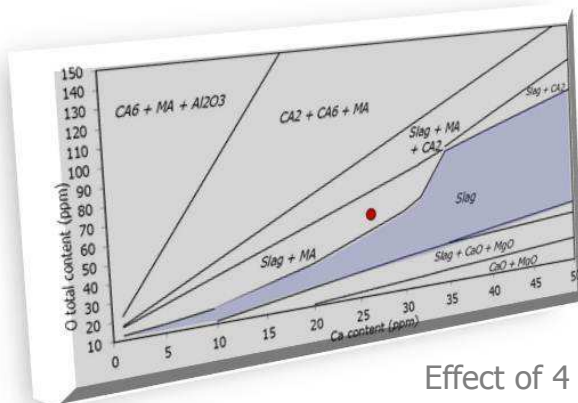
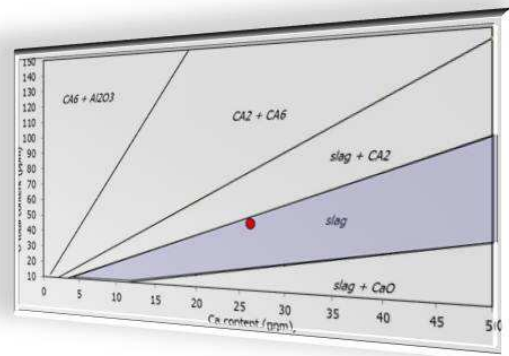
Steel composition (ppm)
Si: 2400; Al:100; Ca: 22; Mn: 7000
O_{tot}: 78

Inclusion analysis (SEM/EDS):
Point 1: (Al₂O₃MgO)
Point 2&3: (CaO)(Al₂O₃)_x



inclusionView takes into account the effect of all minor elements on the obtainment of liquid inclusions.

inclusionView gives the user the ability to appropriately correct steel composition.



Effect of 4 ppm Mg on the inclusion composition for different ranges of oxygen and calcium concentration in liquid steel.