TOWARDS AN IMPROVED B.O.S BLOWING STRATEGY *

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Current Practice For a particular heat, fixed blowing rates are usually observed, save that when slopping, some operators reduce the flow rate. The benefits of this practice are ease of operation, consistency in heat balance predictions, and assured safety margins for the stack, lance and furnace lining. Sometimes, to speed up a heat, increased oxygen flow rates are used,and in experiments increased flow rates are studied.

Lance heights start out high to avoid scrap interferences with the lance,and are lowered for the middle portion of the heat to achieve the benefits of hard blowing. Towards the end of the heat the lance is sometimes raised in aiming for low phosphorus levels.

Motivation for Change Yield figures for the Newcastle plant could be 4% lower than im many steelworks and can undoubtably be improved at least partially, simply by improved blowing practice. The availability of lance current measurements at Newcastle gives information on the operating conditions within the furnace.

Studies suggest preferred sequences of operating conditions and how to achieve these. The anticipated availability of computers for on-line calculations suggests that conservative control actions can be reliably implemented even though these at times may violate for restricted times the limits set for current practice.

Proposal Modify oxygen supply and lance practice as mow detailed. Exceed current practice oxygen blow rates by 10% or perhaps higher as follows:

(i) For the first 6 minutes of the blow.

(ii) During stable negative lance current regimes in the period 14 to 18 minutes of the blow.

(iii) In the last 3 minutes of the blow for a low carbon heat.

Lance heights can be reduced during the first six minutes as the scrap melts, as in current pra-tice, save that the final level can be set to achieve preferred patterns in the lance signals. During the stable negative lance current regimes, the lance can be raised so as not to exit from the desirable blowing pattern, but yet to increase lance life. In the last 3 minutes it is suggested that a 1 metre lance height increase be instituted for 30 to 45 seconds, then a decrease to the previous blowing position.

Rationale By blowing at a higher rate in the first six minutes, the effect of a high lance necessitated by the scrap can be somewhat compensated. There should be minimal risk since the decarbonization rates and stack temperatures are low here. More importantly, there should be a better chance of establishing a desirable hard blowing pattern for the middle of the blow.

During the stable negative lance current regimes, the stack temperatures are invariably low and the flame lean and smooth.* There seems to be no reason not to increase the flow rate in order to speed up the blow and permit a raised lance. The only worry could be a possible increased stack CO level during this regime, since less air may be entrained in the flue gases.* However, the fact that stack temperatures do not increase at all when the oxygen flow rate is increased 10% in this regime suggests there is a margin of safety.

During the last 3 minutes in a low carbon heat, the decarbonization rate is low, the percentage of CO_2 leaving the vessel increases and fume temperatures drop, so that there is no reason not to increase oxygen flow rates. The required late blow softness for dephosphorusization can be achieved by the radical lance adjustments suggested. The advantage of a return to the earlier blowing height (or 10 cm higher say) is that any

* needs substantiations by further testing.

subsequent signal collapse indicates a carbon level otherwise obscured by soft blowing.

The Crucial Question Studies of the lance current measurements suggest that what happens in the first 6 minutes of the blow influence quite a bit the following critical 4 minutes. The thought emerges that if the blow in the first 6 minutes is harder, by virtue of a higher oxygen flow rate, then the slag will not be over oxidized and there will be an improved chance to achieve the desirable stable hard blowing negative lance current regimes. (It is believed that a 10% increase in the oxygen flow rate will not adversely affect the fluidification of the lime.) The crucial question then, is whether it is always possible by such oxygen flow rate and appropriate lance practice to achieve the desirable blowing patterns at the 6 minute mark. If so, then a more consistant blowing practice with improved productivity can be achieved.

Recommendations It is recommended that when bottom bubbling is established and enhanced lance signals* become available in the near future, that relatively informal on-line trials be carried out to assess the proposal and answer the crucial question raised. Also, some assessment can be made on the proposed lance practice permitting, in the case of low carbon heats, a carbon level end-point prediction from the lance current trace.

* Facilities for switched loads and differential signals are currently being developed.