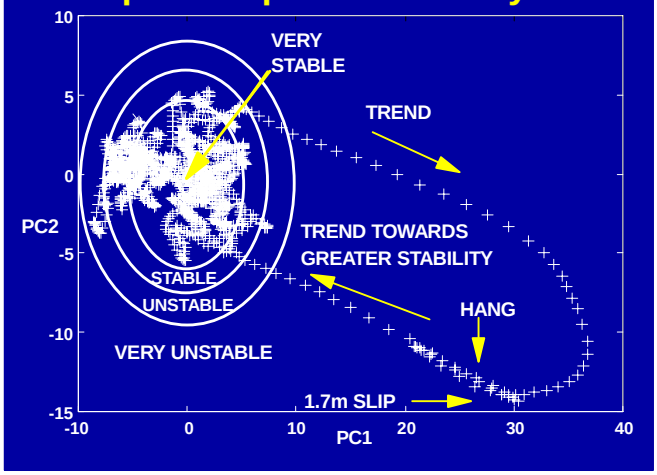
Blast Furnace Fault Diagnostics

Corus Consulting Limited, Teesside Technology Centre, P.O. Box 11, Grangetown, Middlesbrough, Teesside TS6 6UB U.K. Telephone: +44 (0)1642 467144 Fax: +44 (0)1642 460321
E-mail: colin.notman@corusgroup.com

The blast furnace is a complex process with many variables whose interaction and reaction to the furnace operation is not always readily understood. Multivariate statistics [in particular principal component analysis (PCA)] can be used to identify hidden relationships in such data by significantly reducing the number of variables which describe the underlying variations. This allows simpler process control charts to be developed which can highlight problems or out of control situations, where the use of conventional statistical process control (SPC) would not be possible, difficult or misleading. Further, the new variables can be decomposed to establish the cause of the process problem.

Principal Component Stability Trend

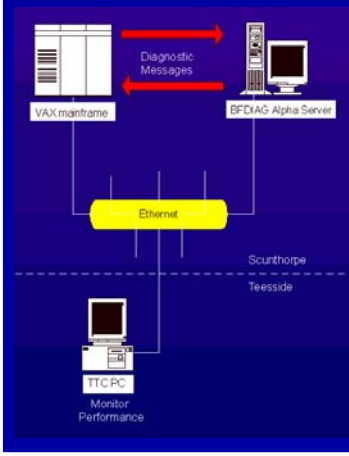


PCA is currently being used on daily burden property and production data. Diagnostic techniques for other fault conditions and overall furnace performance are being developed and will be implemented as they become available.

The main benefits to be gained from using the fault diagnostics are:-

- provision of prior warning of blast furnace instability - allowing early corrective action
- improves blast furnace availability
- improves protection of the blast furnace refractories and hence furnace life
- improves furnace productivity

On-Line Furnace Diagnostics



- HANG / SLIP PREDICTION
- FURNACE STABILITY INDEX
- FURNACE STABILITY TREND
- COOLING WATER LEAKAGE DETECTION
- ADDITION OF FURTHER DIAGNOSTICS

The techniques developed can provide prior warning of instability, thereby allowing early corrective action to be taken. It can also provide information on current aerodynamic stability, furnace stability over the preceding twenty-four hours and identify channelling away from the stock rods. The system can also provide early warning of tuyere cooling water leaks, which, if left unchecked, can have a detrimental effect on the furnace hearth life. An advanced warning of a major slip is shown below.

The diagnostic system is on line at all of British Steel's Scunthorpe's blast furnaces. It has provided early detection of tuyere cooling water leakage up to twenty-four hours before blast furnace personnel would normally identified the leak. A 'stability index' has been produced to indicate how well the furnace is performing.

Hang / Slip Prediction

- **Compare actual and expected decent rate trends**