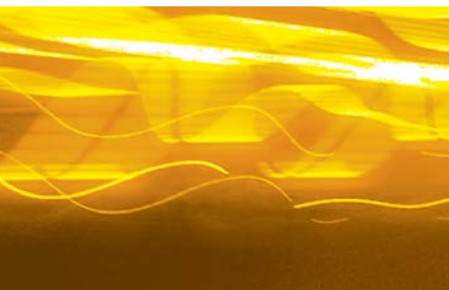




SMART PREDICTIVE LINE CONTROLLER SPLC™

NON-FERROUS ARC FURNACES

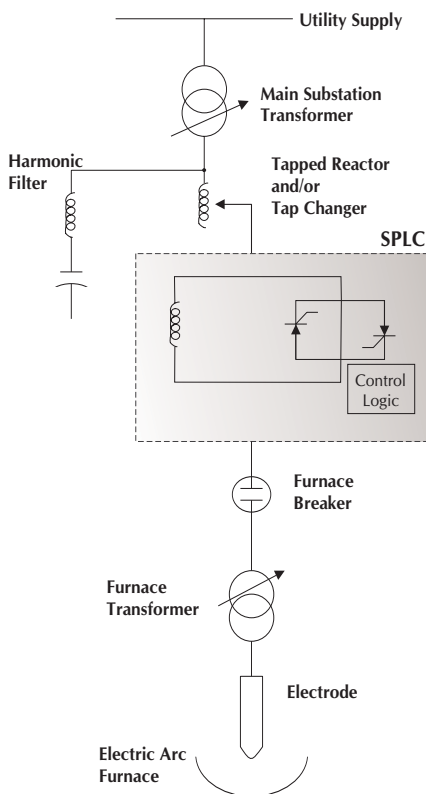


## SMART PREDICTIVE LINE CONTROLLER (SPLC)

### SOLUTIONS

The SPLC stabilizes the arc of an electric furnace by dynamically controlling a series reactor installed between the Power Supply and the Electric Furnace. The controlled reactor acts as a dynamic spring to stabilize the arc.

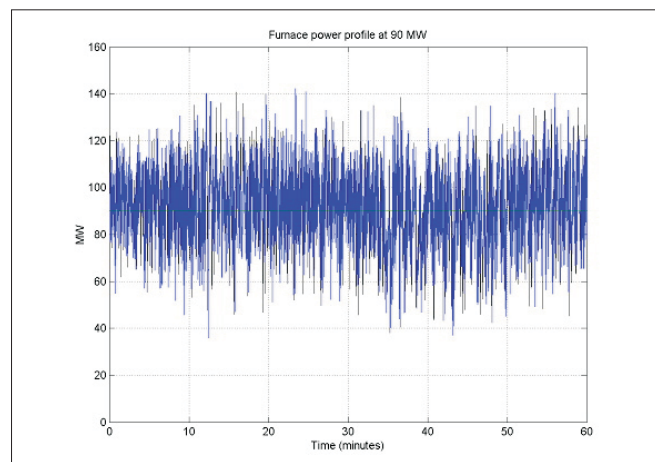
The technology takes advantage of the rapid switching speed of silicon controlled rectifiers (SCR's) and advanced predictive computer controls. The equipment consists of a three-phase, high voltage SCR switch that is operated in parallel with a series reactor.



## SUBMERGED ARC

### FURNACE POWER CHARACTERISTICS

A typical submerged arc furnace generates the following power profile.



In addition to the large power swings the power quality is poor (voltage and current unbalance, frequency swings, harmonics, flicker, low power factor, etc.)

### FURNACE OPERATION DIFFICULTIES FROM FLUCTUATION POWER

- Low average power (particularly due to loss of arc)
- Higher average (KWh/t) usage
- Variability in Feed to Power Balance
- Excessive electrode movement agitates burden
- Excessive electrode travel and wear
- Furnace trips

### POWER SUPPLY AND DISTRIBUTION CONCERNS

- Poor power quality effects on other in-plant and grid users
- Meeting power quality regulations of utility owning the grid
- Site specific difficulties for captive power supply locations

## ELECTRICAL RESULTS - XSTRATA FALCONDO

### POWER STABILIZATION

The measurement in Figure 1 shows the three-phase power delivered to Falcondo Furnace 3 without the SPLC (blue line) and with the SPLC (green line) with the furnace operating set point at 61MW.

In each case, the measurement includes one hour of data. The SPLC reduced the measured standard deviation in furnace power by a factor of 3-to-1.

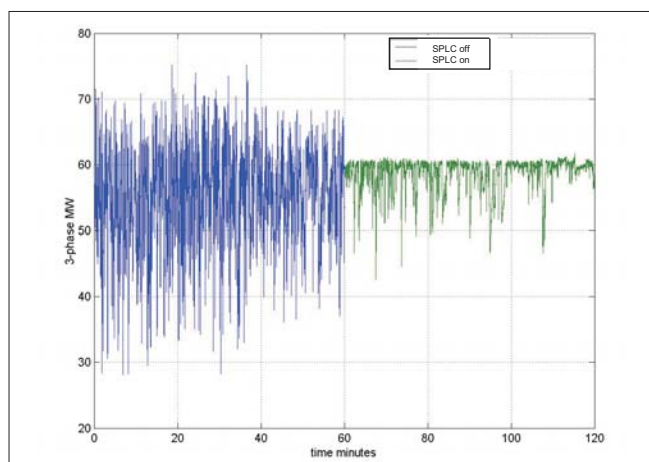


Figure 1: Furnace Power with the SPLC off and on

The SPLC is very effective at clamping the peak power delivered to the furnace. Before the installation of the SPLC the peak power in Figure 1 reached at least 75 MW or about 13 MW above the power setpoint. With the SPLC, the peak power is effectively clamped to only 1MW above setpoint.

### BENEFITS (FALCONDO CASE HISTORY)

- Can now export/import power with Dominican Republic grid
- Increased smelter production capability by 8%
- Improved captive power plant efficiency by 5%
- Reduced electrode consumption per ton by 7%
- Virtually eliminated furnace trips.

### XSTRATA

### FALCONBRIDGE DOMINICANA FALCONDO

First SPLC application for Ferronickel Submerged Arc Furnaces



Sergio Chavez, Falcondo President (left) and Carlos Martinez, Electrical Manager and SPLC Project Manager (center) accept SPLC commemorative plaque from Tom Ma, Hatch (right).

The Falcondo installation includes two SPLCs, one for Furnace 3 and the other for Furnace 1. The original smelting building included three electric furnaces but Furnace 2 has been de-commissioned. The Furnace 3 SPLC was commissioned at the beginning of June 2003 and the Furnace 1 SPLC was commissioned in the fall of 2003.



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