Submerged Arc Furnace Contact Pad and Electrode

Kilo Amp Monitoring System

by

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Introduction

• The system was designed to provide an accurate simultaneous measurement of the individual contact pad kilo Amps and summated electrode current.
• This has not been possible in the past.
• H.V. Test c.c. in South Africa have developed a unique system for the measurement of these currents.
• A number of these systems have been successfully operating on submerged arc closed top furnaces since 1998.
System Goal

• The measurement of the individual electrode contact pad currents (up to MegaAmps/pad) using current transducers, signal processing, isolation and a monitoring system.

• The system can be integrated into the existing PLC or similar furnace control system.

• The goal is to monitor and alarm each contact pad to determine when overloading or underloading occurs due to poor contact or green electrode problems.

• The system can record trends predicting contact pad problems, electrode slipping changes and possible green electrode problems.
The System

- Each set of bustubes is monitored by the system and individual signals are transferred to the control room.
- These signals can be incorporated into the existing monitoring and recording system or into a dedicated PC.
- The PC will present a visual picture of the furnace, the electrodes and the contact pads.
- When a contact pad is being overloaded or underloaded the screen will alarm red or green together with an audible alarm.
- Next to each contact shoe, the current in kA will be reflected together with the phase current per transformer as well as the vectorily summated electrode current.
Should the current on the contact pads vary dramatically this could be an indication of:

- Poor Contact pad service pressure problems
- Overslipping of the electrode and that a green electrode is eminent.
- Indication of furnace mix problems
- Electrode Breakages
- Secondary Transformer winding overloading
- Cooling water temperature problems
- Electrode casing problems
The System cont.

- Cavitation in the electrode
- Arcing of contact shoes
- Double earthing problems
- Possible under coaking
• The transducers can be designed to suit your bustube diameter. From 50mm OD to +500mm OD.
• The transducers are of the split core type and can easily be secured around an existing Bustube.
• The transducers have to be wrapped in fiber glass tape to offer some protection to the transducers – they will withstand an ambient temperature of 150° Celsius maximum.
• Each electrode is serviced by a panel housing the signal conditioning, isolation and passive 4-20mA output signals.
• **Accuracy:** 5% of the full Kilo Amp range. E.g. For 4-20mA which is equivalent to 0-10 kA, the accuracy would be ±0.5kA or ± 0.8mA
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Typical Matte Smelter

SIGNAL CONDITIONING (x48)

4-20MA OUTPUT TO PLC (x48)

FURNACE TRANSFORMER

CONTACT PAD MONITORING POINTS (x24)

CONTACT PAD MONITORING POINTS (x24)

I1

I2

I1+I2

FURNACE
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Typical Delta Smelter

- SIGNAL CONDITIONING (x8)
- CONTACT PAD MONITORING POINTS (x8)
- 4-20MA OUTPUT TO PLC (x8)
- SIGNAL CONDITIONING (x8)
- CONTACT PAD MONITORING POINTS (x8)
- 4-20MA OUTPUT TO PLC (x8)
- SIGNAL CONDITIONING (x8)
- CONTACT PAD MONITORING POINTS (x8)
- 4-20MA OUTPUT TO PLC (x8)
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Typical Transducer Installation
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Signal Cables
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Signal conditioning Cubicle
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Typical Scada screen layout
Conclusion

• We believe that this monitoring system will provide the furnace operators with valuable information allowing optimised operation of the furnace.

• Productivity and Efficiency

• Production Costs