## SUMMARY

### APPLICATIONS IN IRON & STEEL INDUSTRY

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COKE OVEN CHARGING CAR

TYPE OF CABLES USED
- VIBRAFLAME® RV 2.50 V04
- VIBRAFLAME® RV 4.00 V03
- VIBRAFLAME® RV 1.50 V03

DESCRIPTION/OPERATION
The coke oven charging car injects the coke into the furnace through the holes located on top of the furnace. VIBRAFLAME® RV 2.50 V04 and RV 4.00 V03 cables supply power to the different charging car engines which are exposed to rising flames whilst charging. RV 1.50 V03 cable powers the sensors positioning the charging car.

LIFETIME
Five times the lifetime of the former cables used.

CONTRAINTS
- Flame,
- Environment.

FORMER TECHNOLOGY
- Silicone cables, glass fibre braid.

PROCESSUS-GUIDE
(General scheme of cast iron and steel manufacture)
**COKE GUIDE**

**TYPE OF CABLES USED**
- VIBRAFLAME® RV 2.50 V04
- VIBRAFLAME® EV 1.50 V03
- VIBRAFLAME® RV 1.50 STV03

**DESCRIPTION/OPERATION**
The coke guide pushes the coke from the furnace to the ladle car. As the coke reaches temperature of 1200° C, the use of high temperature cables is necessary. They supply power to the guide motors (RV 2.50 V04) as well as to the lighting on top of the furnace doors where the radiating heat is very high (RV 1.50 V03).
The sensors positioning the coke guide are powered by RV 1.50 STV03.

**LIFETIME**
Five times the lifetime of the former cables used.

**CONTRAINTS**
- Radiating heat.

**FORMER TECHNOLOGY**
Silicone cables, glass fibre braid.

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**LADLE CAR**

**TYPE OF CABLE USED**
- VIBRAFLAME® BV 1.50 VP03

**DESCRIPTION/OPERATION**
The limit switches of the ladle car is powered by a VIBRAFLAME® cable 3 x 1,50 (BV 1,50 VP03).
It is not necessary to use a VIBRAFLAME® RV type cable when the temperature is ambient. Nevertheless, the insulation material has to resist to the radiating heat of the cole and to water spraying. For this application, the BV 1.50 VP03 cable is proposed with PFA outer jacket (260°C continuous use).

**LIFETIME**
Five times the lifetime of the former cables used.

**CONTRAINTS**
- Radiating heat.
- Moisture.

**FORMER TECHNOLOGY**
- Silicone cables, glass fibre braid.
**HOOD OR BURNER**

**TYPE OF CABLE USED**
VIBRAFLAME® RV 1.00 STV05

**DESCRIPTION/OPERATION**
The burners ignite the coke to turn it into an incandescent mixture. The cable supplies power to the motorized valves which regulate the air/gaz output allowing the ignition of the burner.

**LIFETIME**
1 week to 6 months.

**CONTRaints**
The radiating heat reaches 80°C. Occasionnally, flames are rising to the valves licking the cables during several minutes.

**FORMER TECHNOLOGY**
Cables with asbestos braid

**QUANTITY**
50 m for each burner.

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**FLAP LEVEL CONTROL**

**TYPE OF CABLE USED**
VIBRAFLAME® RV 2.50 V 02

**DESCRIPTION/OPERATION**
The conglomerate is poured into the cooling system through a hopper equipped with a flap detecting the minimum, maximum and overflow level. Hot air (200°C) cools down the conglomerate. Near to the flap, the radiating heat of the 800°C incandescent material reaches between 400 and 600°C. The cables situated near to the flap are exposed to these temperatures on an estimated length of 5 m.

**LIFETIME**
As an extra length of cable is installed during the first wiring, the end of the cable, most exposed to the heat, can be replaced before the total length must be changed normally after one year.

**CONTRaints**
Radiating heat 800°C.

**FORMER TECHNOLOGY**
Cable with asbestos braid. At high temperatures this braid was cracking and the heat resistance was less efficient.

**QUANTITY**
20 to 25 m for each flap.
ELECTRIC FURNACE

**TYPE OF CABLES USED**

VIBRAFLAME® RV 1.00 VS02  
VIBRAFLAME® RV 1.50 V03  
VIBRAFLAME® RV 1.50 V04

**DESCRIPTION/OPERATION**

The Cu-Ni-conductor cable transmits temperature information of the cooling water running in the panels situated around the interior of the furnace to the control room. This cable also supplies the limit switches used when the furnace is tilted to tap the steel into the ladle, as well as the electrode position limits on the furnace roof. When the furnace roof is opened to charge scraps, the RV 1.50 V04 cable supplies power to the fume extraction motors, situated on the chimneys on top of the furnace.

**LIFETIME**

1 to 3 years with partial changes.

**CONTRAINT**

Even if the permanent radiating heat is of only 80°C maximum RV 1.50 V03 ou RV 1.00 VS02 cables may be exposed to extreme temperatures (600°C) when the furnace is accidentally punched.

**FORMER TECHNOLOGY**

Silicone cables.

**QUANTITY**

300 m.

CONVERTER

**TYPE OF CABLE USED**

VIBRAFLAME® RV 2.50 V03

**DESCRIPTION/OPERATION**

The converter tilts in two directions:
- on one side to receive the hot metal,
- on the other side to tap the iron into a teeming ladle (on a ladle car).

The cable situated underneath the converter supplies power to the positioning sensors.

**CONTRAINT**

There is no major risk of thermal destruction. VIBRAFLAME® is mainly used to guarantee lifetime and security of the equipment.

**FORMER TECHNOLOGY**

Rubber cable with an asbestos tape.
**TEEMING LADLE**

**TYPE OF CABLES USED**
- VIBRAFLAME® RV 4.00 VS04
- VIBRAFLAME® RV 2.50 VS06
- VIBRAFLAME® RV 2.50 HS12

**DESCRIPTION/OPERATION**
The teeming ladle transports the molten steel from the converter to the revolving door near to the continuous casting.
The cable supplies power to the motor opening and closing the ladle gate which opens the way for the steel to the tundish

**CONTRAINT**
- Thermal scattering through the ladle walls.
- Molten steel spillage.
- High ambient, stifling temperature: between 300 and 400°C.

**QUANTITY**
6.5 m for each teeming ladle.

**OVERHEAD CRANE - LADLE TRANSFER**

**TYPE OF CABLES USED**
- (1) = K 1819 ESTETV6 - P 504735
- (2) = VIBRAFLAME® BV 1.50 ST V04
- NOTE = same use as in (1)
- P 503374C = (K2037STE2 + KK 1861) TVSTTV F1

**DESCRIPTION/OPERATION**
The overhead crane transports a steel or cast iron ladle.
Sensors transmit weight information on cable type (2) from the ladle to the transmission box, and on cable (1) from the transition box to a measurement device situated on the winding torque motor.
When emptying the ladle, flames are rising surrounding the compensator and burning the first meter of the winding cable.

**LIFETIME**
(1) = 3 to 6 months.

**FORMER TECHNOLOGY**
The lifetime of the former compensator cable type was 4 months.

**CONTRAINT**
- Rising of flame.
- Radiating heat on the compensator (2).
- Flame, winding-up/unwinding.

**QUANTITY**
(2) = 55 m - 8 sensors
LADLE CAR

TYPE OF CABLE USED
VIBRAFLAME® RV 1.00 ST V04

DESCRIPTION/OPERATION
The ladle car transports the molten steel from the electric furnace to the refining station. Here the steel will be transformed to different quality types.

CONTRAINT
The channel in which the cable is installed is exposed to the molten steel when the ladle accidently overflows during transport.

The cable supplies power to 4 weight sensors situated on each of the car wheels transmitting information on ladle weight and contents.

TEMPERATURE MEASUREMENT/REFINING STATION

TYPE OF CABLES USED
VIBRAFLAME® P 602222
Cu-CuNi compensating extension wire.

DESCRIPTION/OPERATION
To measure the temperature of the molten steel, the operator plunges the insertion pyrometer equipped with P602222 cable into the meeting bath, always at the same depth following the tonnage of the ladle.

The cable links the transition box situated in the other end of the insertion pyrometer.

LIFETIME
After several measurement series the cable is destroyed in the area most exposed to the heat and has to be replaced. The damaged part of the cable is trimmed away, but the remaining length can be used on a shorter insertion pyrometer.

IDENTIFICATION
Colours and dimensions.

CONTRAINT
Radiating heat during temperature measurement.

FORMER TECHNOLOGY
Rigid cable (copper tube).

QUANTITY
Depending on the length of the insertion pyrometers.
TYPE OF CABLES USED

VIBRAFLAME® type RV 1.00 STV05.

DESCRIPTION/OPERATION

Here the VIBRAFLAME® cable is used to supply power to the motor which operates the tundish vaves, allowing the steel to pass for the tundish into the moulds. VIBRAFLAME® cables are also used to power the tundish level controls.

CONTRAINT

The cables are exposed to the radiating heat of the steel as well as to steel projections. It is most important to have a reliable electrical system and to be able to close the valves immediately in the case of a malfunction.

FORMER TECHNOLOGY

Cable with asbestos braid.

TYPE OF CABLE USED

VIBRAFLAME®

DESCRIPTION/OPERATION

VIBRAFLAME® cables are also to power the tundish car. This is the car which lines up the tundish between the ladle and the moulds.

CONTRAINT

The cable is exposed to steel spillage and projections.

FORMER TECHNOLOGY

Cable with asbestos braids.
INGOT OVERHEAD - CRANE

TYPE OF CABLE USED
HYBRID CABLE VIBRAFLAME® - P 602613

DESCRIPTION/OPERATION
This crane takes ingots from the ingot moulding to the heater. The motors are powered by V 3S and V 4.00 wires, the control is carried out by V 2.50.

CONTRAINT
High ingot radiating heat.

FORMER TECHNOLOGY
Rubber cable.

QUANTITY
8 meters.

RE-HEAT FURNACE

TYPE OF CABLE USED
Multiconductor RV type- VIBRAFLAME®.

DESCRIPTION/OPERATION
The blooms leaving the casting line are re-heated before being rolled. VIBRAFLAME® cables supply power to the engines opening and closing the heater doors.

LIFETIME
The cable has never been changed after several years of use.

CONTRAINT
The cable is exposed to radiating heat only during the opening of the furnace. The temperature rises to 200°C. VIBRAFLAME® cables have been chosen as a safety measure to assure a good cable lifetime / to avoid any maintenance of the equipment.

FORMER TECHNOLOGY
Silicone cable.
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