Cable Preheating
Taking care of the production

GH Induction Atmospheres
Agenda

- GH Group
- Introduction
- GH Experience
- Preheating Installation
- Operation & Maintenance
- Innovation & Developments
- Conclusions
Geographic Distribution
Affiliates and Customers

Think globally, act locally

From 1961
Introduction
What is this application?

- This application consists in preheat the copper and aluminium energy cables in the range of $T^a \ [100,180] ^\circ C$ before the extrusion process.
## Introduction

### Advantages

- High quality cables
- Increase of the speed

### Example:

<table>
<thead>
<tr>
<th>Cross Section Cond. Material</th>
<th>Calculated on 25 °C CV Speed</th>
<th>With Preheating (120 °C) CV Speed increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m/min.</td>
<td>m/min and in %</td>
</tr>
<tr>
<td>127 mm², Al</td>
<td>9,05</td>
<td>11,2 + 23 %</td>
</tr>
<tr>
<td>254 mm², Al</td>
<td>7,0</td>
<td>9,15 + 30 %</td>
</tr>
<tr>
<td>54 mm², Cu</td>
<td>10,3</td>
<td>12,8 + 24 %</td>
</tr>
<tr>
<td>127 mm², Cu</td>
<td>7,75</td>
<td>10,0 + 29 %</td>
</tr>
<tr>
<td>380 mm², Cu</td>
<td>3,8</td>
<td>5,1 + 34 %</td>
</tr>
</tbody>
</table>
Introduction
Cable Lines Types

CCV LINE

1 Pay-off Stands
2 Conductor butt welding machine
3 Accumulator
4 Braking unit
5 Conductor preheating
6 Extruder group with triple cross head
7 Diameter/wall thickness measuring device
8 Granules conveying and drying system
9 CV-tube
10 Tractive unit
11 Helper caterpillar
12 Take-up stands

Cc
Introduction
Cable Lines Types

CCV LINE

1 Pay-off Stands
2 Conductor butt welding machine
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Introduction
Cable Lines Types

VCV LINE

1 Pay-off stand
2 Conductor butt welding machine
3 Accumulator
4 Braking unit
5 Conductor preheating
6 Extruder group with triple cross head
7 Diameter/wall thickness measuring device
8 Granules conveying and drying system
9 CV tube
10 Reversing ring
11 Belt-type caterpillar
12 Cable saw
13 Take-up stand
14 Line operating panel Process computer
GH Experience
Total Cable Supplied installations (October 2009)

Power Generators

<table>
<thead>
<tr>
<th>Total</th>
<th>Gen 50 KW</th>
<th>Gen 75 KW</th>
<th>Gen 100 KW</th>
<th>Gen 150 KW</th>
<th>Gen 200 KW</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>139</td>
<td>21</td>
<td>16</td>
<td>57</td>
<td>20</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>
GH Experience
Supplied Cable installations (October 2009)

Cable Applications

- Preheating: 117
- Postheating: 18
- Others: 4

Confidential - 10
GH Experience
Supplied Cable installations (October 2009)

Areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>39</td>
</tr>
<tr>
<td>Korea</td>
<td>8</td>
</tr>
<tr>
<td>Turkey</td>
<td>4</td>
</tr>
<tr>
<td>Russia</td>
<td>5</td>
</tr>
<tr>
<td>Mexico</td>
<td>11</td>
</tr>
<tr>
<td>Europe</td>
<td>50</td>
</tr>
<tr>
<td>Rest of the World</td>
<td>22</td>
</tr>
</tbody>
</table>
GH Experience

References

- Troester
- Nexans
- Caballé
- NKT
- Fujikura
- Goldstar
- Gulf Cable Kuwait
- ABB
- General Cable
- Imacab
- Taihan
- Telefonika Kable
- Siemens
- Prysmian
- Phelps Dodge
- Synergy Cable
- Ericsson
- Conductores Monterrey
- Condumex
- Sevkabel
- Südkabel
- Yuzh Cable
- Waskönig + Walter
- Liban Cable
Preheating installation
Preheating installation
Required Information

- Input Temperature and Output Temperature
- Section and Diameter of the cables
- Speed for the reference cables
- Cable Line angle
Preheating installation

Main Components

- Inductor
- Oscillator circuit
- Inductor frame
- Generator
- Cooling system
Preheating installation
Inductors frame

- Easy and flexible design
- Fix or regulable angle
- Manual or automatic displacement
- Optimal accessibility for inductor change
Preheating installation

Inductors

- Inductor length = 700 mm
- Protections against overhead (brass rings and inner fiber glass pipe)
- Control system for the right position on the frame
- Easy change (< 15 min)
- 7 Inductors type for a cable range 10 up to 3250 mm²
Preheating installation
Inductors Examples

- Simple inductors (5)
  - Vertical position

- Doble inductors (3)
  - Inclined position

- Generator power $\leq$ 100 kW $\rightarrow$ simple inductors
- Generator power 150 kW and 200 kW $\rightarrow$ doble inductors
- Generator power 250 kW and 300 kW $\rightarrow$ triple inductors
Preheating installation
Generator

- IGBT’s Transistors Gen.
- High efficiency
- Maintenance friendly
- Communication system

- Standard dimensions:

  Group A (50-75-100 KW)
  Group B (150-200 KW)
Preheating installation
Normative

Every equipment from GH is manufactured taking into account the safety norms and the applicable standards. Everyone of our installations is delivered with its “CE” conformity declaration.

Machines safety

- EN 292 -1 & EN 292-2
- EN 60 204/1, IEC 204-1, DIN VDE 0113-1
- EN 60 519-1 and 3 & IEC 519-1 and 3

Electromagnetic compatibility

- EN 55 011 & DIN VDE 0871-11
- EN 50 081-2
- EN 50 082-2

Standards

- 98/37/CE
- 72/23/CEE y 89/336/CEE
  And its modification 92/31/CEE

Power calculation

- DIN 48 600

UNE-EN-ISO 9001
since 1995
Preheating installation
Usual values for standard equipment

- Power: 100 kW IGBT Series technology
- Working frequency: 15 kHz
- Section range from 50 up to 630 square mm (required 4 inductors)
- Material to be heated: Al & Cu (DIN 40 500 & DIN 40 501)
Preheating installation
Installations examples

- Fix frame, inclined inductors
- Mobile frame, vertical inductors
Preheating installation

Operation and Maintenance

Benefits for our customers
Operation
Main benefits

- Easy handling for operators
- Quick change of inductors
- PLC’s programs for different cables
- Temperature control (PID – Offset regulation with Pyrometer)
Maintenance & Customer service
Main benefits

- High qualified technicians
- Service worldwide
- Customers technical training
- Guaranteed spare parts
- Project Management
- Internet place for customers
Global service

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Sales, Manufacturing and Service
Innovation & Developments

- Power/speed Calculation programm
- Magnetic and heat simulation with 2DFLUX
- Development solutions for Customer needs (Postheating, cable degazing)
Conclusions

- Long experienced manufacturer
- Fully adaptation to customer requirements
- Global customer service
- Permanent innovation
THANKS FOR YOUR KIND ATTENTION