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# Advances in EHV extruded cables

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# Advances in EHV extruded cables: Content

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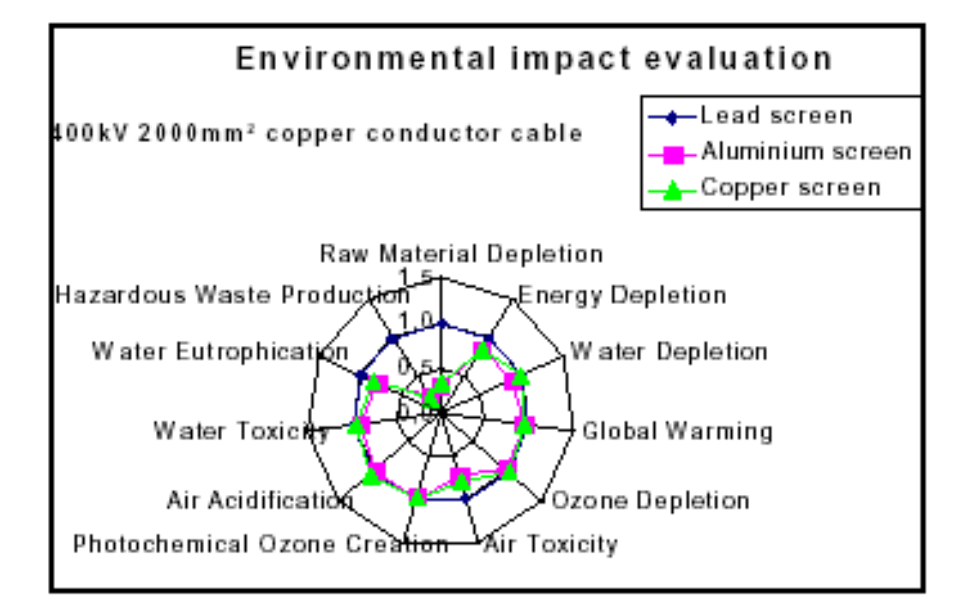



**Comparison of 400kV 2000mm² Copper XLPE cables, as a function of their screen design (CIGRE 2002)**

# Welded aluminium laminate screen 1/2

- **Current carrying capacity: 1800 A**
- **Max ambient temp. 40°C**
- **Short-circuit current: 63 kA for 2 sec.**
- **BIL: 1550 kV but test level is 1675 kV**
- **2500 mm² Copper Milliken, 6 segments**
- **30.4 mm (1197 mils) XLPE insulation**
- **Smooth Aluminum Sheath thickness 2.2 mm (87 mils)**
- **HFFR (Halogen Free Fire Retardant) outer jacket. Thickness 5.5 mm (18 mils)**

# Welded aluminium laminate screen 2/2
# Type Tests Program

- Electrical type tests are based on IEC 62067
- Lightning impulse test: 1675 kV, Switching impulse: 1300 kV
- The Cable Jacket must comply with IEC 60332-3 category A.
- A special compound has been developed by Nexans to comply with the fire requirements and the physic & ...uir...

# Environmental Impact (French report to be published at CIGRE 2008)

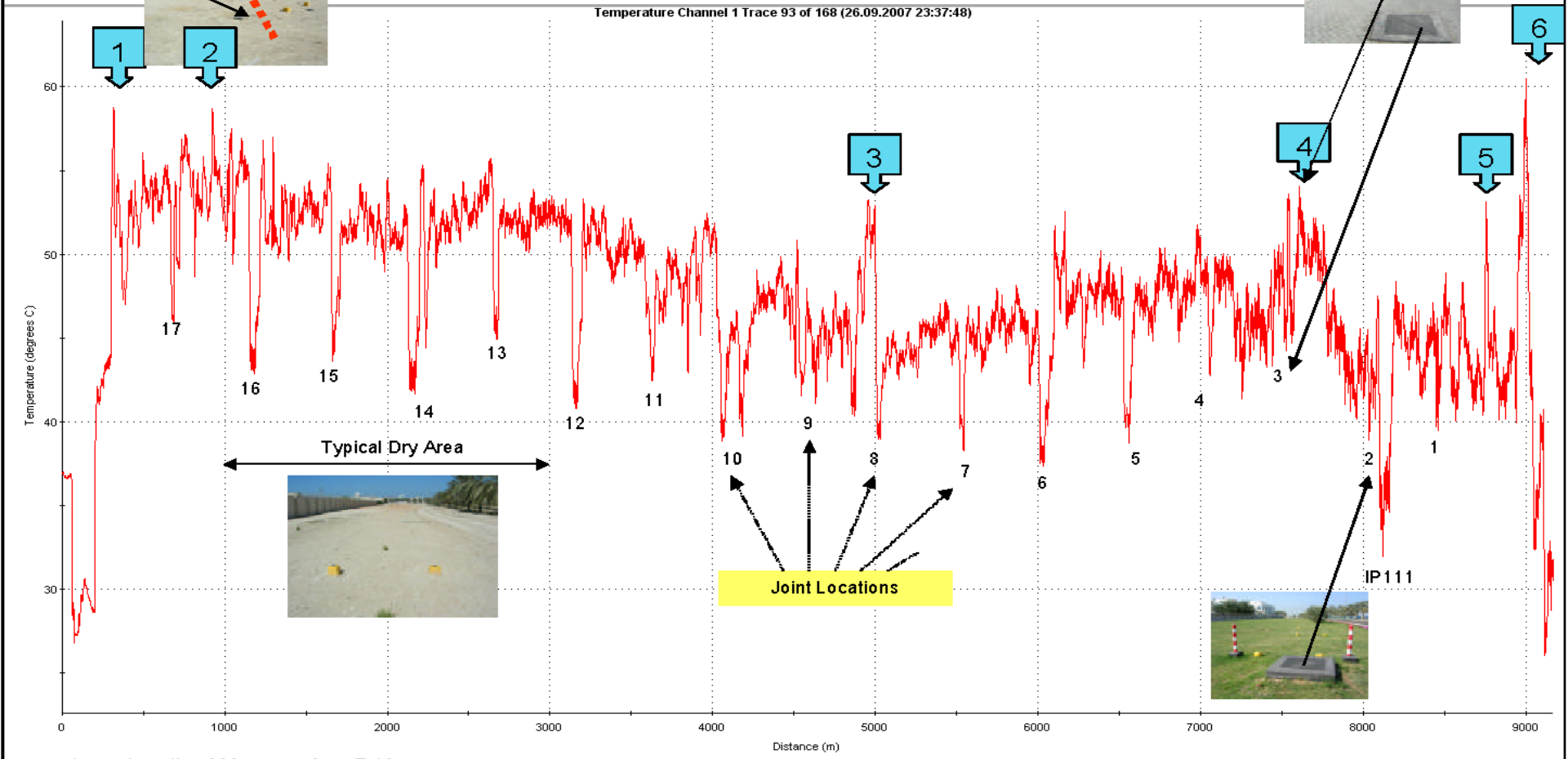
## Comparison of the improvement of cable link impacts with known im

| Improvement | Reference | Global warming reduction |
|---|---|---|
| Screen design<br>Welded Aluminium Screen | 2000 mm² Cu 225 kV (Corrugated.Aluminium.Screen.)<br>= 152 tons $CO_2$/year.link km | 7,8% i.e.<br>12 tons $CO_2$/year.link km<br>= 0,12 truck/year.link km |
| Conductor cross section<br>2000mm² copper(WAS) | 800mm² copper (WAS)<br>= 148 tons $CO_2$/year.link km | 37,3% i.e.<br>55tons $CO_2$/year.link km<br>=0,47 truck/year.link km |
| Insulation of the individual copper wires<br>2000mm² copper(WAS) insulated wires | 2000mm² copper(WAS) bare wires<br>= 185 tons $CO_2$/year.link km | 20,7% i.e.<br>38,5tons $CO_2$/year/link km<br>=0,33 truck/year.link km |
| Insulation thickness<br>18 to 27mm | 800 and 2000mm² (WAS) | Negligible |
| Earthing conditions<br>Single point bonded | 2000mm² (WAS) Solid bonded | High (up to 70%)<br>Solid bonding to be avoided |
| Installation type<br>Trefoil formation | 2000mm² (WAS) flat formation<br>= 198 tons $CO_2$/year.link km | 7,7% i.e.<br>14,5tons $CO_2$/ year/link km<br>= 0,12 truck/ year.link km |

**The global warming of one km of cable link is equivalent to one to two trucks depending on the design, installation and operation conditions**

# Operation in Abu Dhabi 1/2

400kV XLPE Cable Connection (NEXANS): E-19 to E-48 Grid Station **(Max. Load: 845MW)**




1. Location 300m away from E-19:
2. Location 900-1.200m away from E-19: 11kV Cable Crossing
3. Location 4.800-4.900m away from E-19: IP85 Road Crossing (NDCR)
4. Location 7.500m away from E-19: Interlocking Tiles
5. Location 8.700m away from E-19: 11kV & 132kV Cable Crossings
6. Location 9.000m away from E-19: 132kV Cable Crossing

Graph 1

# Operation in Abu Dhabi 2/2

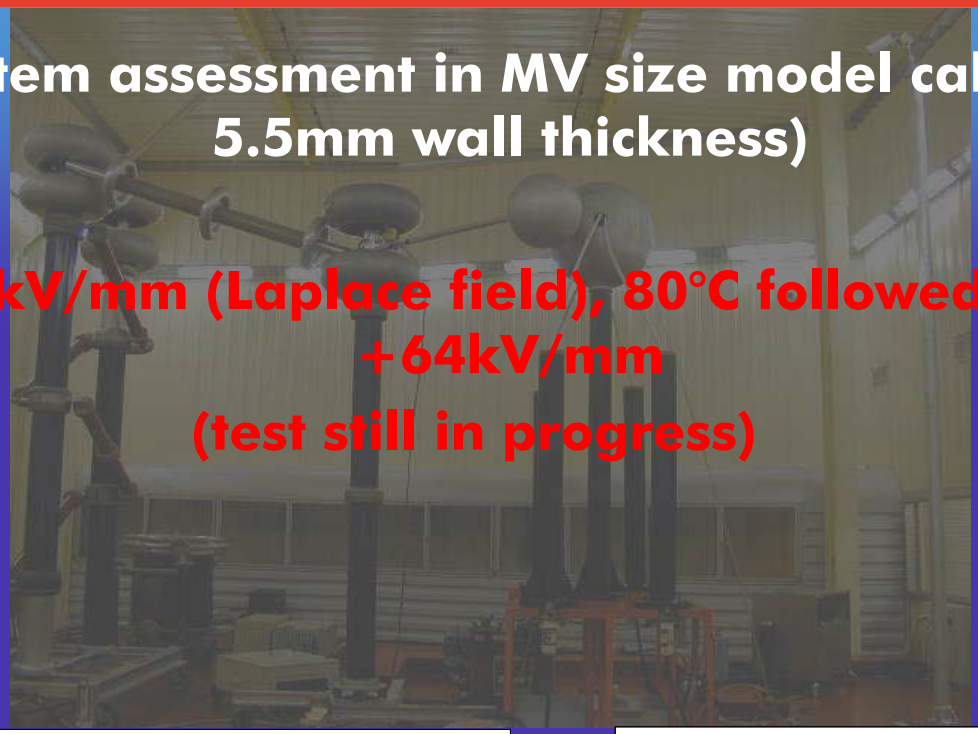
- Fibres are typically in a 30mm diameter pipe which is 250mm far from 2 power cable phases.

- In this environment, temperature measurements are useful to picture out hot spots and changes in the thermal environment of the link.

- The ignorance of such thermal profile could lead to unsuspected overload of the cable.

# Extruded HVDC

## Insulation system assessment in MV size model cables (95mm², 5.5mm wall thickness)



**3000h at – 64kV/mm (Laplace field), 80°C followed by 4000h at +64kV/mm**

**(test still in progress)**