

## Cable Alternatives for Oil, Gas and Petrochemical Industry

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### ABSTRACT

*The following paper discusses different cable design alternatives for the OGP industry. Lead sheathed cables are in use for many years. However, due to cable weight and it's handling, special polymeric cable designs are also being used. This paper makes a direct comparison between the two designs for LV and MV cables for different physical and electrical properties. The OGP industry thus can make a better cable selection based on the specified requirements to be met.*

### 1. INTRODUCTION

The Oil, Gas and Petrochemical (OGP) industry uses different types of cables which include LV, MV, Instrumentation and special cables. The OGP environment is characterized by various types of fluids and hence the cables used in such environment are designed to resist attacks of chemical products consisting of acids, bases and different hydrocarbons.

This paper provides brief information on alternative designs available and its comparison.

### 2. DESIGN OPTIONS

#### 2.1. Lead sheathed cable

Lead is a well-known material in the industry for more than a century. It was used in paper insulated cables for keeping moisture away as lead sheath provided a seamless impermeable metallic sheath. Pure lead sheath exhibited certain defects during initial period which were cracking, fracture, corrosion etc. These were overcome by the use of different lead alloys.

The chemical composition of lead alloys is specified by BS EN 12548 for particular alloy. A common alloy among users is PB021K (earlier known as Lead alloy E). The lead sheath thickness is arrived at as per the EEMUA 133 specification in case of LV cables and IEC 60502-2 fictitious method for MV cables. The lead sheath is acceptable practice and time tested design over the years. Being metal, lead sheath offers a conducting path to share the earth fault current when required

#### 2.2. Poly AL + HDPE + Polyamide sheathed cable design

Some clients require an alternative to lead sheath design when cable weight and handling is critical. In order to cater to these requests an alternative design is available. This new design cable consists of three construction

elements in layers for providing complete protection as mentioned below.

- Polymer laminated AL tape applied longitudinally to provide radial barrier for various fluids
- HDPE sheath which is resistant to inorganic chemicals and
- Polyamide sheath (also known as Nylon layer) which is resistant to organic chemicals and hydrocarbons

These three layers are provided in co-extrusion process making a strong bond for fighting against chemical attacks faced in OGP environment.

Polyamide is well known for its ability to provide chemical resistance. It is suitable for functioning at cable operating temperature. It exhibits good flexural modulus and offers low permeability of hydrocarbons, maintaining the main physical and chemical properties in the finished cable.

### 2.3. OGP Industry

The following types of cables can be offered with lead sheath or Poly AL + HDPE + Polyamide sheath design technology,

- LV cables
- MV cables
- Instrumentation and pilot cables
- Flame retardant cables
- Armoured and un-armoured cables

Thus the OGP industry gets wider range of choice and cable designs for application

These cables are designed to meet,

- IEC 60332-3 flame retardant tests in cat A / B / C as per design
- Hydrocarbon resistance
- Low toxicity

Both designs are suitable for use in OGP environment. There are certain differences in the properties of the two designs and these are discussed in the paper.

The gland selection for these cables can be done with standard selection criterion.

### 3. COMPARISON

A general comparison between Lead sheathed cable and Polyamide sheathed cable is per the following table.