LSZH Sheath Cracking In Harsh Environment

Arun **THOMBRE (1)**
1 - Ducab, Dubai, UAE,
arun.thombre@ducab.com

ABSTRACT

The following paper discusses the LSZH sheath cracking issue faced in harsh environment. The ambient temperature during summer time reaches very high in certain places. The cable surface temperature can be as high as 70 ºC. At such high temperature the LSZH sheath is observed to crack open exposing the inner cable assembly. The basic purpose of the cable sheath is to provide primary mechanical protection and with such cracking phenomenon it completely gets defeated.

This paper examines different experiments performed to observe the sheath cracking issue

1. INTRODUCTION

The Low Smoke Zero Halogen (LSZH) sheath is used in various cables requiring special properties of light transmittance and low emission of corrosive gases when affected by fire.

The LSZH sheathed cables are observed to offer good fire properties. However, while enhancing the fire performance, it is observed that some of the mechanical properties for the material get sacrificed. The cables made with LSZH sheath were observed to get damaged easily as compared to the PVC / PE sheathed cables. The cables with LSZH sheath in high ambient temperature environment like Middle East were observed with sheath cracking phenomenon exposing the inner cable assembly.

2. LSZH CABLES

The term 'LSZH' is used along with many other abbreviations and causes confusion many times. The same compound is called with various abbreviations in different part of world or by different clients and these abbreviations are observed to be,

LSF: Low Smoke and Fume

LSZH / LSOH: Low Smoke Zero Halogen

LSHF: Low Smoke Halogen Free

HFFR: Halogen Free Flame Retardant

The LSZH outer sheath is used in the cables which are designed for special application. These cables do not propagate the fire, do not emit toxic fumes and do not release smoke. To achieve these special properties, the sheath material is made with compounds which are non-halogenated. Many compounds offer reduced flame propagation due to the halogen present in their structure e.g. PVC. However, the halogenated compounds have negative side effect that in fire they can release the halogens or acidic fumes which are extremely toxic. When combined with the moisture in eyes they are very irritating to human. The smoke causes low visibility hampering the rescue operation in fire and the acidic fumes affects breathing.

The LSZH provides better solution to these problems. All the materials used in the cable are required with zero-halogen property. The complete cable is tested for smoke emission test in a chamber and the light transmittance is checked for required % level.

To achieve these properties, the LSZH outer sheath compound is based on polyolefins such as EVA, polyethylene and other ethylene copolymers. In order to get the required level of fire performance, these compounds are loaded with mineral fillers like alumina trihydrate or magnesium hydroxide. The level of addition of these fillers is controlled by the compound suppliers and they provide the processing conditions for achieving optimum performance during outer sheath extrusion.

3. THE CABLE DESIGN

3.1 Design Standards

The BS 6724 is used for designing the low voltage power, control and auxiliary cables. Whereas, the BS 7835 specification is used for designing the medium voltage cables. Both these standards refer to LTS1 grade of outer sheath material to offer low smoke and zero halogen properties. The similar cable designs are also covered in IEC 60502 series of standards.

The cables are designed with the LSZH outer sheath extruded over wire armour.

3.2 The Sheath Cracking

At times it is observed that the LSZH outer sheath develops crack and it propagates along the length of the cable. The inner cable assembly gets exposed in such a phenomenon and outer sheath does not serve the desired purpose. This phenomenon is more predominant during the summer in middle east weather, when the ambient temperature reaches around 45 to 50 ºC peak in the afternoon time. The cables which are outside in open atmosphere get directly exposed to the intense heat. The outer sheath absorbs the maximum heat from the sun rays and the cable surface reaches approximately 70 ºC making it soft and vulnerable to the cracking.

The LSZH outer sheath which exhibited the crack propagation, when tested as per the standards is observed to pass all the material properties without any issues.

3.3 The Laboratory Experiment

To understand the sheath cracking phenomenon, an experiment with two raw material grades was performed to check the effect with different type of damages and at