CASE STUDY

Improve your efficiency while decreasing formulation and production costs for MV XLPE cable production

Additive:  LOWINOX® FAST XL liquid antioxidant solution

Applications:  Cross-linked polyethylene (XLPE) insulated power cables produced by the direct peroxide injection (DPI) process.

Key benefits
› Improved production efficiency
› Lower formulation costs

The Challenge

On top of improved production efficiency, producers of cross-linked polyethylene (XLPE) power cables are looking for solutions to help them lower their total formulation costs without compromising the cable performance.

To meet this critical objective, cable producers need to consider and evaluate the latest innovative technical developments.
The Solution

LOWINOX® FAST XL liquid antioxidant is the best solution for cable producers.
You have probably read our first Case Study explaining how LOWINOX® FAST XL can help XLPE cable producers to increase their productivity (+5% faster cross-linking speeds) and improve cable quality consistency. If you missed it, you can still access it here:

Read our first Case Study!

LOWINOX® FAST XL antioxidant meets the challenging performance requirements of XLPE power cable manufacturers:
- Long-term heat aging performance
- Scorch protection
- Excellent compatibility with organic peroxides
- High cleanliness levels

It is a drop-in replacement for the current liquid industry benchmark and helps to overcome weaknesses such as the strong interference with peroxides and the fact that the industry benchmark becomes solid at low temperatures (less than 15°C).

LOWINOX® FAST XL, a new generation high performance antioxidant for cross-linked polyethylene (XLPE) applications, is a good option for XLPE power cable producers using the DPI process who are looking for improved production flexibility and lower production costs.

Improved production efficiency

The existing liquid industry benchmark provides insufficient polymer protection, which can lead to an increased generation of ambers resulting in premature cable failures. Furthermore, these ambers can block and discolor the screen pack and tooling during cable production leading to increased downtime and maintenance.

Thanks to LOWINOX® FAST XL, you can reduce your downtime!

LOWINOX® FAST XL has been designed to deliver improved thermal protection during cable production enabling increased cable reliability and longevity.

For more details, read our first Case Study featuring these performance benefits:

Read our first Case Study!
LOWER PRODUCTION & FORMULATION COSTS
In addition to more production flexibility, LOWINOX® FAST XL enables XLPE cable producers to reduce production and formulation costs:

Lower production costs
Thanks to LOWINOX® FAST XL, you can benefit from:

- **Lower labor costs** thanks to the pre-blending of antioxidant and peroxide.
  LOWINOX® FAST XL antioxidant and the liquid organic peroxide form a stable mixture enabling premixing and storage prior to use in production. Other advantages are **enhanced production flexibility and quality**. Pre-blending reduces the risk of dosing errors associated with the addition of individual components.

- **Reduced energy costs**
  LOWINOX® FAST XL is still a liquid below 0°C so no pre-heating is required before use. This is also a good advantage for the product storage as a heated store room is not essential.

Lower formulation costs
Thanks to LOWINOX® FAST XL, you can reduce the usage of your key raw materials.

When using LOWINOX® FAST XL, cable producers can **optimize their formulation costs by reducing both their peroxide and antioxidant dosage by 6-8%**, without any compromise on the mechanical and electrical performance of the cable!

This is illustrated by the technical data presented below in Figure 1, which shows that for an equivalent crosslinking speed the peroxide content can be reduced by 8% when the antioxidant content is fixed. A similar effect is observed when comparing the antioxidant content at a fixed peroxide dosage:

![Figure 1: Maximum XL speed - LOWINOX® FAST XL vs. industry benchmark](image-url)

Standard XL speed with industry benchmark = 1.8 dNm/min
With LOWINOX® FAST XL, **cable producers can reduce peroxide dosage by 8%**.

LOWINOX® FAST XL enables dosage optimization of both the antioxidant and peroxide delivering lower costs as presented in the case below based on actual industrial cable trial results. Identical cable designs and processing conditions were used. As an illustration assuming a cable producer uses 5MT per annum of the competitive liquid antioxidant to produce a certain cable design then both the antioxidant and peroxide can be reduced as shown in the table below when LOWINOX® FAST XL is used to produce the same cable design:

<table>
<thead>
<tr>
<th>Competitive antioxidant</th>
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</thead>
<tbody>
<tr>
<td><strong>AO Dosage (%)</strong></td>
<td><strong>Annual Volume (MT)</strong></td>
<td><strong>Annual Cost (K$)</strong></td>
<td></td>
</tr>
<tr>
<td>Competitive antioxidant</td>
<td>0.240</td>
<td>5.0</td>
<td>111</td>
</tr>
<tr>
<td>Peroxide</td>
<td>1.21</td>
<td>25.4</td>
<td>222</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30.5</strong></td>
<td><strong>333</strong></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>LOWINOX® FAST XL</th>
<th></th>
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<tbody>
<tr>
<td><strong>AO Dosage (%)</strong></td>
<td><strong>Annual Volume (MT)</strong></td>
<td><strong>Annual Cost (K$)</strong></td>
<td><strong>Savings (k$)</strong></td>
</tr>
<tr>
<td>LOWINOX® FAST XL</td>
<td>0.225</td>
<td>4.7</td>
<td>104</td>
</tr>
<tr>
<td>Peroxide</td>
<td>1.11</td>
<td>23.3</td>
<td>204</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28.0</strong></td>
<td><strong>308</strong></td>
<td>25</td>
</tr>
</tbody>
</table>

With LOWINOX® FAST XL, you can lower formulation costs thanks to:
- 6% reduction in antioxidant dosage
- 8% reduction in peroxide dosage
- $25,000 combined savings per annum per DPI line

As a recap of both Case Studies featuring LOWINOX® FAST XL, **here is a table listing the main benefits provided by this high-performance liquid antioxidant**:

<table>
<thead>
<tr>
<th>BENEFIT</th>
<th>IMPROVEMENT GAINED</th>
<th>ADDITIONAL PROFIT</th>
</tr>
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<tbody>
<tr>
<td>Faster cross-linking speeds</td>
<td>+5% faster speeds</td>
<td>+277 K$</td>
</tr>
<tr>
<td>Improved cable quality consistency</td>
<td>2% lower off-grade Production</td>
<td>+124 K$</td>
</tr>
<tr>
<td>Lower formulation costs</td>
<td>-7% in peroxide/AO dosage</td>
<td>+25 K$</td>
</tr>
<tr>
<td>Additional handling &amp; quality benefits</td>
<td></td>
<td></td>
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</tbody>
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