

Case study

Reliable cable fastening under challenging outdoor conditions

Managing chemical and mechanical stress in solar cable management

The challenge



Typical zinc chloride corrosion 3 years after installation at a location near the Pacific Ocean

Accelerated cable tie degradation in solar cable management systems

Solar power systems rely on extensive wiring behind modules and across mounting structures. In many installations, these cables are typically secured with UV-stabilised nylon 66 (PA66W) cable ties, selected for their strength and proven outdoor performance.

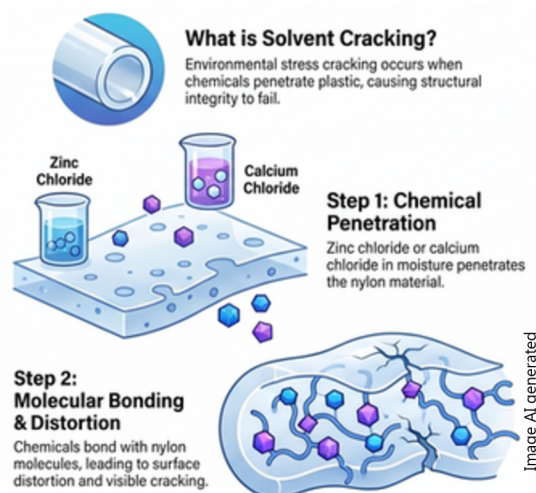
However, our field visits to a solar plant site that has been operational for a couple of years in Japan highlighted a recurring issue in harsh outdoor conditions: the durability of cable management in solar farms depends on more than just good UV resistance.

Cable ties are exposed simultaneously to mechanical loads, temperature variation, moisture and a range of chemicals. Over time, this combination of environmental factors can accelerate material degradation. When the mix of stressors includes salt in coastal areas, de-icing fluids in colder climates and other aggressive substances present in industrial or agricultural settings, these conditions can accelerate degradation and increase the risk of premature cable tie failure.

Environmental stress cracking in chloride-rich outdoor environments

Solar mounting structures are typically made from galvanised steel to resist corrosion. When these zinc surfaces react with salt or de-icing agents, chloride-rich residues form and accumulate. These chemicals interact with the polymer material the cable tie is made from. When this chemical exposure is combined with the constant tensile load placed on cable ties, environmental stress cracking can occur.

In practice, substances such as chlorides or other aggressive agents penetrate the polymer structure and weaken it over time. Under constant tensile stress, microscopic cracks develop, grow and ultimately lead to sudden failure of the cable management.



The solution

GalvaLok for durable cable management in challenging outdoor locations

Precision moulding enables high-performance of PA11 cable ties

Following detailed analysis, HellermannTyton engineers identified that performance under the combined effects of weathering, chemical exposure and mechanical abrasion was the critical factor, rather than the focus on UV resistance alone.

Nylon 66 solutions – even when optimised for UV resistance – remain sensitive to chemical interaction with zinc chloride, which can lead to rapid embrittlement and failure under load.

Nylon 11 (PA11) was selected due to its high resistance to chemicals, including salt-derived chlorides, as well as its stability across a wide range of temperatures and humidity conditions.

But PA11 also brings manufacturing challenges. Its lower flowability makes it harder to mould into precise components such as cable ties and frame mounts.

Adaptable cable management from PA11 for different mounting options

Solar installations vary significantly in structure and layout, and cable fastening requirements differ from one mounting design to another. To support these different installation methods, the solution covers several approaches: securing cables through existing holes in mounting frames, fastening them along structural edges and installing them without modifying the frame.

To complement **GalvaLok cable ties**, HellermannTyton developed **a range of nylon 11-based products** tailored to these fixing methods. This has now become part of the comprehensive cable management portfolio for solar installations around the world.

HellermannTyton addressed this by refining mould design and processing conditions to achieve stable mass production of high-quality nylon 11 cable ties.

The result was the **GalvaLok fastening and fixing product series**, developed specifically for use in coastal solar parks and other chloride-rich outdoor environments.



GalvaLok ties are made from PA11, which maintains its mechanical integrity even when moisture, chemicals and thermal cycling occur simultaneously.



GalvaLok Cable Tie Push-Mount with arrowhead hole fastener and wings



GalvaLok Edge Clip for 1 or 2 solar cables run parallel or perpendicular

The result

Durability in demanding outdoor environments



Choosing the right plastic materials for cable fastening under load is vital in coastal areas or where de-icing is a regular winter occurrence

Reliable performance across solar applications and beyond

GalvaLok has demonstrated strong resistance to the combined effects of weathering, chemical exposure and mechanical stress.

Cable ties manufactured from PA11 show high resistance to salt-induced degradation and maintain mechanical performance after accelerated weathering tests designed to simulate long-term outdoor exposure.

This can support more reliable cable management throughout the intended service life of solar installations, helping to reduce the risk of early failure and associated maintenance costs.

The solution has been adopted across a range of solar applications, including installations in coastal regions and other locations where conventional materials have reached their limits under a challenging combination of weathering and site-specific chemical conditions.



Polyamide 11 (PA11) is derived from renewable castor bean oil rather than fossil-based feedstocks. Alongside its inherent resistance to UV exposure and a wide range of chemicals, it delivers reliable cable fastening performance under challenging outdoor conditions.

Contact us to benefit from our expertise in solving your application challenges

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