WHITE PAPER ANALYSIS

Ty-Rap® high performance ties

Performance analysis of metal barb cable ties versus plastic cable ties under extreme conditions

Ty-Rap white paper

Results

General test results

- Performed favorably when under extreme heat, extended heat, humidity or long term UV exposure.
- The metal barb generally performed favorably to the other brands
- Exhibited superior qualities of reliability under extreme conditions.
- The metal barb ties tended to simply slip once they reached their failure points but they remained intact and no debris left the tie.

OPT ties:

- All ties more commonly broke catastrophically, throwing debris into nearby areas

Conclusions

Ty-Rap:

- Ty-Rap ties outperform other brands in key areas such as high-heat environments, UV exposure and cold weather
- Ty-Rap ties performed at almost twice their rated load after 5,000 hours of high-heat exposure
- TY27MX performed similarly under UV exposure, holding almost twice their rated load
- Ty-Rap cable ties performed with 100% success in temperatures down to -60°C.
- Ty-Rap ties very rarely fail in a manner that creates additional debris or sheds plastic into the environment.

General ties:

- All-plastic cable ties often fail catastrophically, casting their plastic pawl or pieces of cable tie into the environment.
- Some all-plastic cable tie brands failed to perform at their rated load.
- Some all-plastic cable tie brands failed to withstand the 5,000 hours of UV exposure.
- Several all plastic brands failed in temperatures as “warm” as -20°C.

Ty-Rap cable ties

Test overview

Test 1

Low installation temperatures

Ten ties of each variety and aluminum mandrels of three sizes were chilled in a controlled chamber to -20 °C, -40 °C, -50 °C and -60 °C (-4 °F, -40 °F, -58 °F and -75 °F) and allowed to stabilize at each temperature. During the cooling period, while still inside the chamber, the ties were then installed around the aluminum mandrels representing a small bundle diameter and a large bundle diameter. They were then inspected for any breakage or failure points.

Test 2

Varying temperature tensile strength – high heat

Ten ties of each variety were fastened around mandrels and conditioned in a humidity- and temperature-controlled chamber at 125 °C (257 °F) in increments of 1,000 hours up to 5,000 hours. They were then reconditioned at 23 °C (73.4 °F) and 50% humidity — the smaller ties for 15 days and the larger ties for 30 days. They were then subjected to a split-mandrel tensile test and pulled to their rated loads for five minutes. If they held, the ties were then pulled to failure.

Test 3

Extended UV exposure tensile strength

Groups of ties of each variety were fastened around mandrels and exposed to UV light in a controlled chamber for a total of 5,000 hours in 1,000-hour increments, with test samples beginning at 2,000 hours. Each group was then reconditioned at 23 °C (73.4 °F) and 50% humidity — the smaller ties for 15 days and the larger ties for 30 days. They were then subjected to a split-mandrel tensile test and pulled to their rated load for five minutes. If they held, the ties were then pulled to failure.

Test 4

Vibration

Ten ties of each variety were conditioned at 23 °C (73.4 °F) and 50% humidity, then installed on horizontally and vertically mounted split mandrels and vibrated for 72 hours on an XY vibration table to test their ability to hold.

Ty-Rap cable ties

Test 1 – Low installation temperatures

Test 1

The ability to install cable ties at low temperatures is crucial for installations that must withstand wide-ranging weather conditions. These include those that operate outdoors, such as oil and gas facilities, rail, marine, ground /aerospace transportation. As well as those that operate indoors under a wide range of conditions, such as food and beverage plants.

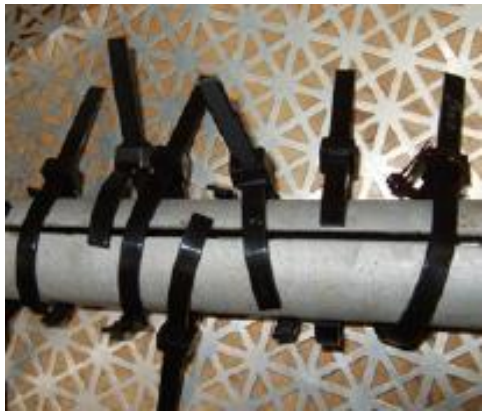
We conditioned the ties of each variety in a controlled chamber to several low temperature conditions. Then checked their conditions after installation on a mandrel. Some didn't survive the installation at all.

Results

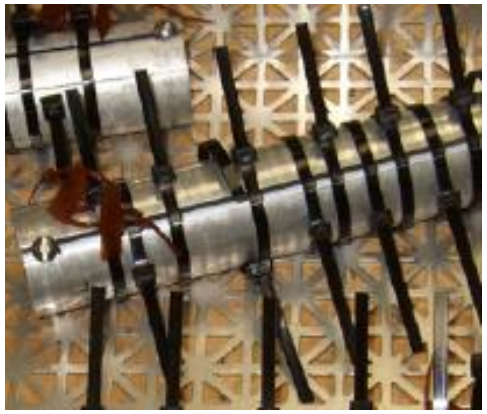
Ty-Rap ties performed with 100% success at -20 °C, -40 °C, -50 °C and -60 °C (-4°F, -40 °F, -58 °F and -76 °F) levels. Most all-plastic ties experienced at least partial failure at such low temperatures. Some failed completely at all temperature levels tested.

Ty-Rap cable ties

Test 2 – Varying temperature tensile strength – high heat



01 Competitors' ties breaking during 2,000 hr. heat aging



02 Competitors' ties breaking during 4,000 hr. heat aging

Test 2

The ability to withstand constant high heat is crucial wherever such conditions are present. Applications like engine compartments, various industrial settings and food and beverage facilities.

Results

Ty-Rap ties exhibited superior tensile strength-to-failure characteristics under most high heat exposure conditions.

On the lower end of the performance scale, several all-plastic sample groups exhibited catastrophic failure while still in the heat aging chamber, prior to tensile testing.

The mode of failure is also important. Under most conditions, Ty-Rap ties simply slipped when they reached their failure point, resulting in no spread of debris. Many all-plastic ties snapped or shed their pawls, which could cause debris to fly into nearby products or applications.

Ty-Rap cable ties

Test 3 – Extended UV exposure tensile strength

Test 3

The ability to withstand constant UV exposure is crucial in any industry that subjects equipment to extended outdoor exposure. These include solar and wind equipment, oil and gas and all modes of transportation. Such as road or bridge rail signals and lighting.

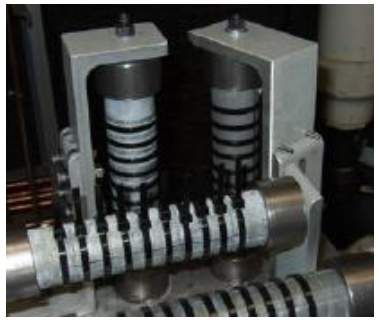
Results

Ty-Rap ties exhibited superior tensile strength-to-failure characteristics under most UV exposure conditions.

On the lower end of the performance scale, several all-plastic sample groups exhibited catastrophic breakage. Most were able to perform at least to their rated loads before failure ensued. Under all tested UV conditions, the Ty-Rap ties simply slipped when they reached their failure point, resulting in no spread of debris. Many all-plastic ties snapped or shed their pawls, which could cause debris to fly into nearby products or applications.

Ty-Rap cable ties

Test 4 – Vibration



01 Competitor 2
50 lb. ties before

02 Competitor 2
50 lb. ties after

03 TY27MX before

04 TY27MX after

Test 4

The ability to withstand constant vibration is crucial in many industrial and transportation applications. Cable ties that slide out of place pose a hazard to properly holding the bundled wire.

Methodology:

Ten ties of each variety were conditioned at 23 °C (73.4 °F) and 50% humidity, then installed on horizontally and vertically mounted split mandrels and vibrated for 72 hours on an XY vibration table.

Results

During the vibration process, Ty-Rap cable ties showed very little sliding/slippage on the test mandrel. The design of the ribs and stipples on the inside of the strap help prevent lateral slipping in applications while the adjustability of the smooth strap provides proper tension. While not all competitive cable ties failed this test, some showed significant slippage along the vertical vibration test.

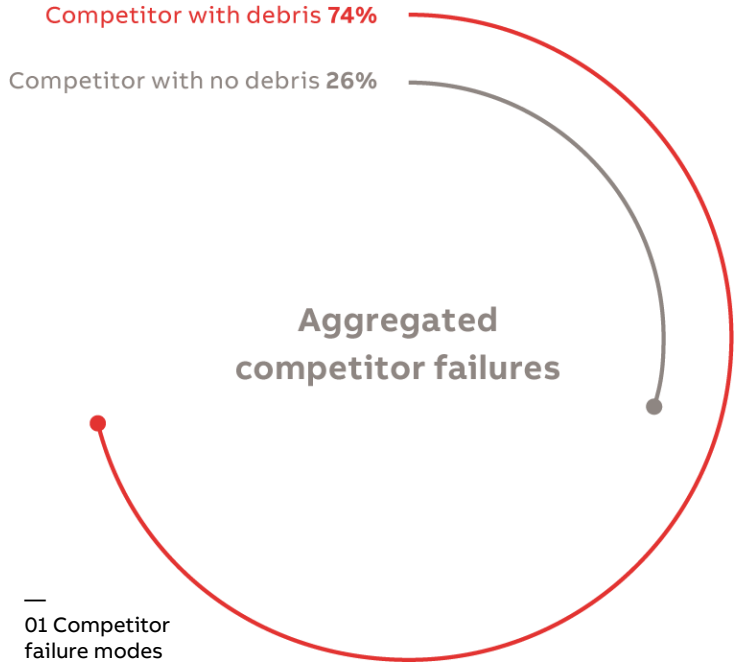
Competitor 2 50 lb. ties showed significant slippage in vertical vibration, as shown below.

Ty-Rap cable ties

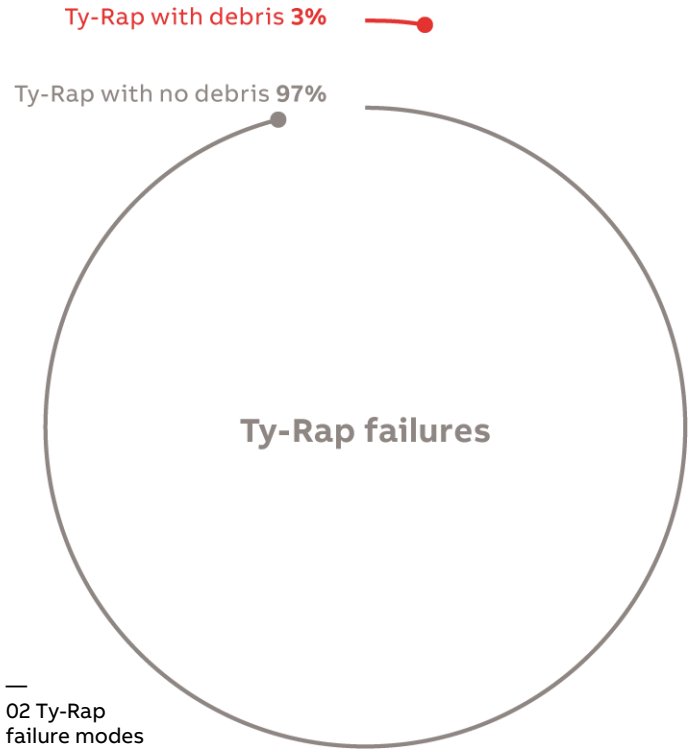
Failure modes

Also noted were the failure modes of all cable ties during testing. Ty-Rap ties generally fail without causing additional debris, or casting debris into the environment. All-plastic cable ties frequently have the ratcheting pawl fail, causing it to be ejected into the environment rather than staying captive in the tie head.

Graph 1 illustrates the percentage of competitor's all-plastic cable ties that failed causing debris to enter the nearby environment. Graph 2 shows that Ty-Rap cable ties rarely fail in a manner that causes debris.



01 Competitor failure modes



02 Ty-Rap failure modes

Ty-Rap cable ties

Summary of test results

	Low temp. test	High heat test	Extended UV test	Vibration test	Debris on failure
Ty-Rap					
Competitor 1					
Competitor 2					
Competitor 3					
Competitor 4					
Competitor 5					

 Pass

 OK

 Fail


ABB