SAMSON TECHNICAL BULLETIN

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Impact of Elevated Temperatures on K-100™ Synthetic Crane Hoist Line

The impact of elevated temperature on synthetic rope is commonly misunderstood. There are two common questions raised on this topic; the impact of environmental ambient temperature and the effect of synthetic ropes interacting with contact surfaces inherent to their application *(like a crane hoist line that comes in contact with the boom and other surfaces on the crane).*

Samson conducted a number of tests on K-100™ to investigate the effect of elevated temperature on breaking strength.

Ambient Temperature

Samson performed break testing on K-100 samples after exposure to elevated environmental temperatures. This testing explored the instantaneous strength-reducing effects of environmental temperature conditions ranging from ambient air temperatures of ~25°C to 70°C, which exceeds the recommended maximum operating temperature (60°C) for K-100 by 10°. Samples were exposed to the target elevated temperature for 30 minutes utilizing an apparatus in line with the break test machine.

Immediately following this period of heat soak, load was applied to the test samples until failure occurred. The same elevated environment temperature was maintained up to the failure point. The resulting peak loads provide an estimated instantaneous strength loss within the given temperature ranges, shown in Figure 1. Continuous exposure to constant ambient temperature allows the entire rope structure to come to equilibrium with the elevated temperature environment.

In addition, other Samson test results indicate that ropes made with Dyneema® fiber stored in ambient temperatures up to 75°C for extended periods have been shown to have no significant reduction in strength when then tested at room temperature.

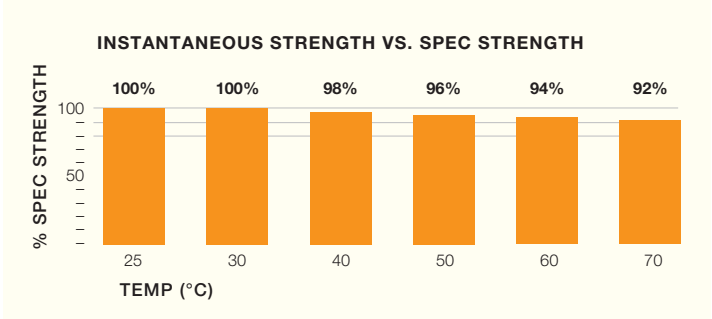

FIGURE 1

Effects of Conductive Heat

When a rope comes in contact with a hot surface, the heat is conducted into the rope. However, unlike the effects of ambient heat, the conducted heat may not increase the entire rope's temperature to the same temperature as the contact surface. The data in Figure 2 demonstrates test results for three of Samson's ropes made with 100% Dyneema® high modulus polyethylene (HMPE) or a Dyneema®/polyester blend. It is important to note that Samson's K-100 is made of a blend of high performance fibers, the majority being Dyneema®. The non-Dyneema® fibers are more resistant to high temperatures than Dyneema® or traditional fibers like polyester. Therefore, the data below should be considered the worst case scenario and it stands to reason that K-100 tested would outperform these three ropes in the same test.

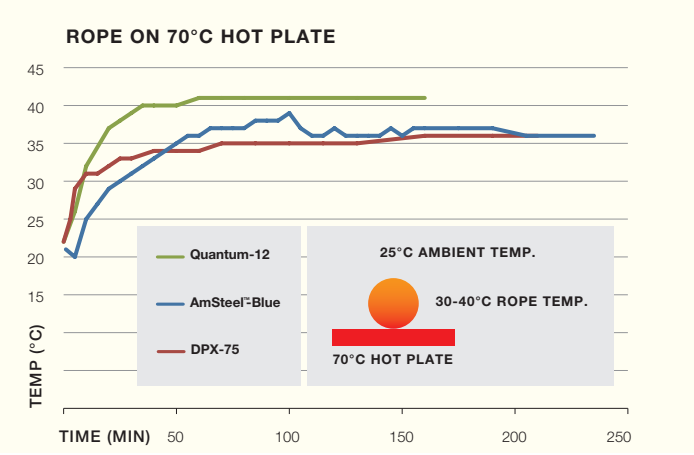

FIGURE 2

Lab tests placing the ropes on a 70°C constant heat source show the temperature increases with time, as shown in Figure 2. Unsurprisingly, the rope's opposite surface never reaches the heat source temperature, instead reaching a steady-state equilibrium between the heat source temperature and the environment.

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