

Greetings all. Today's Bulletin is about High Modulus Polyethylene (HMPE) synthetic fibre rope.

When it comes to synthetic material used for crane related applications, the first thing comes to mind is synthetic slings with their different colour coding for different workload limits (1t-Violet; 2t-Green; 3t-Yellow; 4t-Gray; 5t-Red; 6t-Brown; 8t-Blue; ≥10t Orange).

Advantages

The biggest advantage of synthetic slings compared with other types of slings is their light weight which reduces the overall lift weight and crane size.

ROUND SLINGS Comply to AS4497									
FLAT SLINGS Comply to AS1353									
L - LOAD FACTOR		L - 1.0	L - 0.8	L - 2.0	L - 1.7	L - 1.4	L - 1.0	L - 1.7	L - 1.38
Colour Code	W.L.L Tonnes	Vertical W.L.L Tonnes	Choke S.W.L Tonnes	Basket S.W.L Tonnes	60° S.W.L Tonnes	90° S.W.L Tonnes	120° S.W.L Tonnes	60° S.W.L Tonnes	60° Choke S.W.L Tonnes
Violet	1.0	1.0	0.8	2.0	1.7	1.4	1.0	1.7	1.3
Green	2.0	2.0	1.3	4.0	3.4	2.8	2.0	3.4	2.7
Yellow	3.0	3.0	2.4	6.0	5.1	4.2	3.0	5.1	4.1
Grey	4.0	4.0	3.2	8.0	6.9	5.6	4.0	6.9	5.5
Red	5.0	5.0	4.0	10.0	8.6	7.0	5.0	8.6	6.9
Brown	6.0	6.0	4.8	12.0	10.3	8.4	6.0	10.3	8.2
Blue	8.0	8.0	6.4	16.0	13.8	11.2	8.0	13.8	11.4
Orange	10.0	10.0	8.0	20.0	17.3	14.1	10.0	17.3	13.8

Similar to synthetic slings, synthetic HMPE fibre ropes used for lifting purposes offer significant weight savings when compared to wire rope of the same capacity. This allows a single rigger to do a task that would otherwise take multiple people to perform with wire rope.

Synthetic HMPE fibre hoist ropes for crane applications are not new, they have been successfully used for many years.

With loads getting heavier, today's crane operators are constantly facing the challenge of how to increase their productivity. Traditional steel wire ropes are heavy in large quantities, which reduces the maximum lifting capacity for cranes.

Synthetic HMPE fibre ropes are lightweight, about 80% lighter than steel wire rope at the same strength [1], this gives cranes the potential to handle higher payloads.

Synthetic HMPE fibre ropes also offer other properties that make them very suitable for use as hoist ropes;

- They have very low stretch and as a result, do not store energy when under a tensile load
- They are much more flexible than steel ropes and;
- They do not suffer fatigue and wear in the same way that steel ropes do, and have a longer life span as a result
- Synthetic HMPE fibre ropes do not require lubrication, they are "non-spin", they will not rust and they will not kink, or "bird's nest" as wire ropes do [2].

The use of synthetic HMPE rope as an alternative to wire rope continues to grow as technological advances continue.



In the picture above, 138mm synthetic rope per meter mass is 10kgs versus steel core wire rope at 65kgs. Breaking strain -1440 tonnes versus 1155 tonnes.

Synthetic fibre rope vs Wire rope

We have discussed the advantages of using synthetic fibre ropes. What about the disadvantages?

Steel wire ropes, with long time use in the industry, have built a respected track record and reliability.



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They are a well-proven, solution with high radial stiffness and optimal spooling behaviour. They are not bound by temperature restriction as much as synthetics and their sensitivity to cuts and/or damage is much lower ^[3].

There is a bank of general knowledge in the market on the selection, storage, handling, maintenance, use, inspection, and discard of steel wire ropes (AS2759 Steel wire rope - Use, operation and maintenance).

For synthetic HMPE fibre ropes, such knowledge is often outdated, and training on the material property and handling of this type of rope is still to be developed.

Synthetic slings have their own Australian standards (AS 1353 Flat Synthetic-webbing Slings and AS 4497 Flat Synthetic-round Slings). Synthetic HMPE fibre rope will have its own updated standard in the near future.

The new Australian standard AS 18264 HMPE Fibre Rope Lifting Slings (modified adoption of the ISO standard ISO:18264) is currently at its final stage of development and will be published soon.

When purchasing this type of rope, beware that the quality and properties with HMPE can vary depending on the fibre, meaning that there will be marginal differences in creep, life span and fatigue.

Source your product from reputable manufactures to make sure:

- You are getting the best grade of fibre
- The rope is proof tested and certified
- You'll have access to technical support where required (i.e., safe use and inspection guidance and checklists)

References

[1] https://www.dsm.com/dyneema/en_GB/applications/ropes-lines-slings-chains/crane-ropes.html

[2] April 2019, What is Synthetic Rope?, Colin Rice.

[3] 24 November 2020, Wire versus synthetic rope products, Hannah Sundermeyer,

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