

A SURVEY OF TECHNOLOGIES FOR THE PRODUCTION OF CORDAGE FOR NAVAL USAGE TERMS AND VOCABULARY

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GENERALITY

The introduction of new technology to produce fibres for textile use (**man made fibres**) and the parallel development of naval industries, has consented the introduction for the common employment of products realized in syntetic fibres.. Particulary are used fibres derived by macromolecules of polymers. For certain specific application , e.g. school ship Vespucci e Palinuro, are again used natural fibres like Manilla or hemp.

All the more polymers used are:

Polypropylene – Polyester - Polythylene- Poyiamide

TYPES OF CORDAGE FOR NAVAL USE

Before to analyze some uses in naval application, it is important to keep back some definitions :

Cordage : product independent of size,in wich twisting, plaiting or braiding of any fibrous material produces a finished article, sensibly round in cross section. The collettive therm for rope, line and cord.

Twist : the number of turns applied per unit length

Yarn : twisted entity composed of filament, staple fibres, or fibrillated film held together by twist

To lay : to twist two or more components about each other to form a helix around the axis of the resulting laid item , which may be a strand or a rope. With this operation we can produce a strand or a rope or a braid.

Strand : product obtained by twisting together two or more yarns prior laying into a rope

Hawser laid rope : rope of three strands where the strands are twisted to form helices around the central axis.

Braided cord: cord of braided construction

Braided rope : rope formed by braiding or plaiting the strands together as opposed to twisting them. NOTE the terms “braiding” and “plaiting” are considered to be synonymous.

Eight strands plaited rope :rope normally composed of four pairs of strands plaited in a double 4 strands coreless round sennit.

Pitch (or plait pitch): longitudinal distance along the axis of the rope from a point on the crown of one strand (or plait) to the corresponding point one strand (or plait) along.

The most important component in a rope is the yarn or **base yarn** (yarn obtained from the manufacturer, consisting in a wound package of parallel filaments on which subsequent twisting operations are performed).Its values of identification are **linear density or linear mass** (the mass for unit length of linear material) and **tenacity** (expression of breaking stress of cordage, related to its fineness, rather than more usual relationship to cross-sectional area. It is determined by dividing the breaking strength of the material by its linear density to produce a value for the tenacity of the material in Newton/tex)

For naval use , it is possible to find three principal types of cordage:

1. Hawser laid
2. Plaited rope
3. Braided rope

HAWSER LAID

A certain number of yarns are twisted together to form a strand. The number and size of yarn to make each strand depend on the size of the rope it is intended to make. This stage is known as “twisting the strands” and again the twist can be left handed or right handed. Three or four strands are now made in up into a left handed or a right handed rope. This process is called “laying” or “closing” and is always carried out in the direction opposite to that used in the previous stage of twisting the strands; it is, moreover, distinct from the simple spin or twist and is two fold in that:

1. the strands are twisted up together to form the rope and at the same time
2. the strands are rotated individually in the direction of the original twist.

When this not done, laying the strands up together would tend to untwist the yarns in each strand. As the rope is laid up, its length contracts like a coiled spring, giving it a certain elasticity. The harder the twist given to the strands in laying. The shorter will be resultant rope and thus a rope is said to be hard laid, ordinary laid or soft laid. In practice, three strands of 275 mt lay up into a rope of about 220 mt in length. Three strands so laid up constitute a hawser laid rope. The strands tend to unlay unless the end of the rope is whipped (i.e. firmly bound) with twine. The rope will stretch under load and will not completely recover when the load is removed. The rope acquires a permanent and irreversible set; the higher the load in relation to the breaking strength, the greater the set. The set may be observed by the extension in length and reduction in diameter when the rope is slack and will eventually render the rope unfit for service. The older and more worn rope, the less elasticity it will possess and the weaker it will become. Rope under load will tend to twist in the opposite direction to that of its lay and thereby tend to unlay itself, but it should regain its normal form when slack. When wet, will usually shrink in length in proportion to the amount by which it swells in diameter, but it will recover its original length when dry and after use. Rope which is continually subjected to heat and damp – when in the tropics, for example- will lose its elasticity and strength sooner than rope used under normal conditions of temperature and humidity.

PLAITED ROPE

The rope is constructed of eight strands arranged in four pairs, two pairs of left hand lay and two pairs of right hand lay. This arrangement is known commercially as “squareline” but in naval use is commonly referred to as multiplait. Its properties are very similar to hawser laid except that it is softer rope and does not kink.

BRAIDED ROPE

This rope, known commercially as core/cover rope, is constructed by crossing and recrossing the yarns or strands in “maypole” fashion such as that each yarn or strand passes alternatively over and under

one or more of the others to form a circular tubular sheath, which may contain a core. All braided ropes fall into one of the following categories:

1. braided sheath around a braided core having a heart of parallel strands
2. braided sheath around a hollow braided core
3. braided sheath around a core of either parallel strands, or a three strand rope, or a multiplicity of three strand rope core members
4. braided sheath with no core (hollow centred rope)

The use of braided rope is limited to certain specific applications. Braided construction gives the following advantages over hawser laid ropes:

- good flexibility and easy handling when wet or dry, new or worn;
- non rotating and will not kink;
- more grip on capstains or warping drums because of the greater contact area.