



ANNUAL MEETING, 1965

Netting Twines For Trawls

Investigations on the selectivity of trawls have demonstrated that not only the mesh size, but also the kind of the fibres used for the netting twines has a decisive influence on the result. More exactly, the selectivity is influenced not so much by the properties of the fibres as by the properties of the netting twines as a whole. These twine properties are caused not only by those of the fibres but also by the construction and preparation of the netting twines. Especially the diameter, coarseness, flexibility and extensibility have been mentioned as properties of netting twines which may have some influence on the selectivity. But it must also be mentioned, that we have, till now, little evidence of the precise nature of this influence. On the other hand, it has been found that netting twines with similar pertinent properties as those of manila, sisal, polyethylene and polypropylene on the one hand, and of cotton, hemp and polyamide on the other hand, have a similar selectivity.

To get an idea of which netting twines are used for trawls, especially for the cod ends, in the convention area, the Subcommittee on Gear and Selectivity decided during the last Annual Meeting, that a list of netting twines should be prepared. To facilitate comparison between these twines, the sizes of all net-materials should be given according to the tex-system.

The following countries have been asked for contributions:

Canada	Iceland	Portugal	USA
Denmark	Italy	Spain	
France	Norway	USSR	
Germany	Poland	UK	

Unfortunately, no reply could be received from Denmark. The reports from the other countries have been attached in this document without any alterations.

The natural and synthetic fibres so far mentioned by the different member countries for trawl twines can be seen from the following list:

Country	Natural fibres				Synthetic fibres			combined twines
	manila sisal	cotton	polyamide	polyester	polyvinyl-alcohol	polyethylene	polypropylene	
Canada	+	+	+	+	+	+	+	+
Denmark								
France						+		
Germany			+			+		
Iceland	+					+		
Italy			+				+	
Norway		+	+	+		+	+	
Poland			+					
Portugal						+		
Spain	+		+			+	+	
USSR			+					
UK	+		+			+	+	
USA	+	+	+	+		+	+	

The different twines are sold under many trade names, sometimes varying from country to country. Some trade names are mentioned in the attached reports.

In contrast to the natural fibres, whose diameters have a limited variation, synthetic materials can be fibres or monofilaments with a wider range of diameters. For that reason, netting twines made of synthetic fibres or monofilaments are differing very much in their properties. Synthetic materials, such as polyethylene,

...../2

are used as monofilaments only. This is also true of polypropylene in some countries.

Except for monofilaments, chemical fibres may be used as staple fibres, similar to those of cotton, or in the form of continuous fibres similar to silk. Polyamide fibres are used as staple fibres as well as continuous fibres; polyvinyl alcohol fibres are used as staple fibres only. Netting twines may also be made from other chemical types of fibres, usually staple fibres and continuous filaments. Netting twines made only of staple fibres often have the letter "s" following the numbers. This means "spinning count" (see Canada 5, 7 and 9^{*}).

According to the definition of the Subcommittee, Textile Products for Fishing Nets, in the International Organization for Standardization (ISO), "netting twines" mean all materials used for net-making. Netting twines for trawls are products made usually of several yarns twisted or plaited (braided) together. Very often the twines are not simply constructed of single yarns but may also be cabled, that means several plied yarns (of simple twines) are doubled to produce a netting twine. In this case the directions of twist in each doubling or twist operation may alternate.

Plaited (braided) netting twines are plaited of at least 6 single yarns. Plaiting can be made with or without core.

Twisting as well as plaiting can be either loose (soft) or tight (hard). Therefore we distinguish soft, medium and hard-laid netting twines. The degree of twisting or plaiting (laying) influences some properties of the netting twine. The strength, for instance can decrease with harder twisting or plaiting and the extensibility can increase at the same time.

The comparison of netting twines is difficult because the system of counting (size designation) varies between different countries. A great variety of numbers is used with reference sometimes to the single yarn and sometimes to the whole netting twine.

In the following paragraphs some explanation of the numbering systems is given in so far as they are mentioned in the attached reports from the different countries. Unfortunately, it has not been possible in all cases to find out the meaning of the numbers mentioned. The reason will be discussed later.

The diameter has been used to designate many netting twines, especially the coarse twisted netting twines used for bottom trawls, and also usually, for plaited materials. The diameter is given in mm or inch (see Canada 7, Germany 1, Iceland Norway 1, Poland, UK 2, USSR and USA 2). We must bear in mind that these numbers are very often only nominal and may not agree precisely with the actual diameters. In netting twines which are made of monofilaments, sometimes the diameter of the single monofilament is given, sometimes in tenths of a mm. In this case, and also when the diameter is given for the whole netting twine, the number of single monofilaments may be written following the value for the diameter (see Germany 1, Norway 2, UK 2).

Another well known system to characterize netting twines, especially those made of manila or sisal used for trawls, is the runnage. This means the number of meters which weigh 1 kg (m/kg) or the number of yards which weigh 1 Engl. pound (yards/lb, see Iceland: manila, UK 3, USA). Sometimes, the runnage also means the number of feet weighing 1 lb (feet/lb, see Canada 9: trawl twines). Moreover, it must be remembered that the runnage in some countries is given for the single yarns from which the netting twines are made (Germany) and in other countries for the total netting twine (Iceland, Spain, USSR, UK, USA). Usually, the number of single yarns will be included whether the runnage refers to the single yarns or to the whole netting twine.

Conversions:	m/kg x 0,496 =	yards/lb
	m/kg x 1,489 =	feet/lb
	yards/lb x 2.015 =	m/kg
	yards/lb x 3 =	feet/lb
	feet/lb x 0.333 =	yards/lb
	feet/lb x 0.672 =	m/kg

*) Countries in brackets refer to the attached reports in the appendix. The number means the sheet of this country.

For cotton twines, in many countries, the English count system for cotton (Ne = number, english) is used (see Norway 2). This number gives how many yarns, each 840 yards (= 768.1 m) long, weight 1 lb (= 453.6 g). Following this number is another one which gives the number of these yarns which are twisted together. A netting twine may be 3 ply, 6 ply, 9 ply etc. Usually the number of yarns is written in such a way that the construction of the netting twine can be seen. For instance, Ne 10/12, or preferably, according to the single-to-fold order, Ne 10/4/3, means that, of a cotton yarn which has the number 10 (10 x 840 yards have the weight of 1 lb), 4 yarns are twisted together to form the primary strand, and 3 of these primary strands are further twisted together to form the netting twine (secondary strand). In some countries only one cotton number (yarn size) is used for the construction of a range of sizes of netting twine. In this case very often the number for the size of the yarn is omitted, but only the number of the single yarns is mentioned. This is very often the case with Ne 10 well known in America (see Canada 3, USA 1) and with Ne 20 very often used in Japan (see Canada 4). We will find this also with other systems of numbering.

The English cotton number is based on the English measuring system. By comparison the metric number is based on m and kg. The metric number (Nm) says how many yarns, each 1000 m (1093,6 yards) long, weigh 1 kg (2,205 lb.). In the same manner as with the English numbering system, the number of yarns twisted together is written after or sometimes before, the metric number of the yarn (see Germany 1, Iceland, USSR). It is possible to give the metric number for the whole netting twine rather than for the single yarn (see Norway). If the metric number contains a fraction or is smaller than unity, sometimes it is multiplied by 10 (e.g. Nm 1.2 = 12/10) or by 100, or more often by 1000 (e.g. Nm 0.4 = 400) for twine designation purposes. When the metric number is multiplied by 1000, the result (in Germany designated by Nt) is identical to the runnage in m/kg (see Germany 1, Norway: Polyamide, braided). The metric number can be used for all netting twines.

Another measurement has been developed for silk and adopted for continuous synthetic fibres. This is the international titer (Td). This system says how many deniers (1/20 g. = 50 mg) are the weight of a yarn with a length of 450 m (= 492 yards) or, what means the same, how many grammes are the weight of 9000 m of the yarn under discussion. Usually we have Td 210 for yarns made of continuous polyamide fibres, Td 250 for those of polyester (see Canada 5) and Td 190 for yarns made of polypropylene (see Canada 2, UK 3). Sometimes a multiple of Td 210, e.g. 420, 840 etc. is used for polyamide yarns. In the same manner as before the number of single yarns is written after the number for the yarn denier in the single-to-fold order, e.g. Td 210 x 2 x 3 or 210 x 6 (see Poland). Also for this numbering system sometimes the denier number for the yarns may be omitted and only the number of yarns is mentioned (see USA).

Conversions: Nm x 0,591 = Ne (cotton)
 Ne (cotton) x 1.693 = Nm
 9000/Nm = Td
 9000/Td = Nm

This has shown that many, sometimes misleading, numbering systems are used for netting twines. As can be seen from the attached reports some identification very often is missing. Sometimes it is very difficult to tell from a single number the exact meaning of the number if no other data are included. Very often correct numbers are altered e.g. by combining Td with the number of single yarns (see UK 1) or, as mentioned before, by omitting the number of the yarn (see Canada 2: Courlene, Canada 8 and 9: spun Nylon, USA).

Moreover, the identification of netting twines may become impossible if an arbitrary trade number is used, varying from factory to factory (see Canada 2: trawl twines etc., Canada 7, Germany 1). The following list gives an approximate equivalence between American polyamide netting twines and the more usual 210 denier designation (see Canada 1 and 2, USA).

...../4

No.2 = Td 210x6	No.7 = Td 210x21	No.18 = Td 210x51	No.36 = Td 210x99
3 210x9	8 210x24	21 210x66	42 210x108
4 210x12	9 210x27	24 210x81	48 210x141
5 210x15	12 210x33	30 210x87	54 210x150
6 210x18	15 210x36	33 210x90	60 210x168

The low numbers agree with the numbers of folded yarns divided by 3, but this is no longer correct for No. 12 etc.

The International Organization for Standardization (ISO) has proposed to replace all numbering systems by the tex-system. The Subcommittee 9 - Textile Products for Fishing Nets agreed that this system should be used also for all netting twines made of all kinds of fibres, in each form and in each construction, either twisted or plaited. This system of yarn count gives the mass in grammes of one kilometre usually of the single yarn. Normally, the number of yarns is written after the tex number of the yarn in the single-to-fold order to give details of the twine-structure. For coarse netting twines and for all plaited twines the Rtex (resultant tex) number of the twine has to be used. This number gives the weight of 1000 m of the whole netting twine in grammes (g/1000 m). If the runnage in yards/lb or m/kg is known, the Rtex value, can be computed as follows:

$$Rtex = \frac{1\ 000\ 000}{m/kg}$$

$$Rtex = \frac{496\ 055}{yds/lb}$$

By this method the netting twines may be compared, but it has to be mentioned, that this calculation is based on the weight. Thus netting twines with the same Rtex-number, but made of fibres with different specific gravities may have a different diameters. Also hardness of twist or braid, even in twines made of the same fibre, can cause differences in diameter between twines of the same Rtex.

In the lists attached in the appendix more ^{than} 900 netting twines are mentioned. There are great quantitative differences:

Canada	586	Italy	24	Spain	15
France	5	Norway	43	USSR	8
Germany	26	Poland	3	UK	92
Iceland	17	Portugal	13	USA	98

There is some doubt that all these netting twines are used for trawls, especially for cod ends (single or double braided). For the cod ends of bigger trawls netting twines with a number of R 5000 tex and more may be used.

In the following lists (p 9-18) the Rtex numbers for the heavier netting twines of the different countries are placed together. With the help of these lists, the Rtex of various commercial trawl twines can be found.

For these lists some abbreviations have been necessary:
Nat = natural fibres, PA = polyamide, PE = polyester, PT = polyethylene, PP = polypropylene.

The chemical names of the synthetic fibres and the trade names have been mentioned as far as possible. From the natural fibres means:
C = cotton, Ma = manila, Si = sisal.

If possible, the degree of laying has been mentioned. ML = medium laid, HL = hard laid. BR means braided (plaited).

If there is more than one list for a country, the number of the list is mentioned in brackets, e.g. (1) etc.

...../5

In the list of Canada: Bl = Bluenose, Br = Brownell, Co = Columbian and Go = Gold Medal are brand names. "Ends" is identical to "yarns". A mixed twine (Terylene + Nylon) has been mentioned with PE-fibres.

In the list of Germany: G and T means two different factories.

In the second part of the list of Italy are mistakes, which could not be corrected before finishing this paper.

In the list of the United Kingdom: "Ma" means manila as well as sisal.

R..tex	CANADA				FRANCE		
	Nat	PA	PE	PT	PP	PA	PT
5 000	Ma:100-3 Ma:100-4	Nylon6.6Comb ML:60			Drumfil:72 Trawl C K		
5 100		Bl:72 Br:60 10/21/3	DacronML:54	Courlene:4x21			
5 200		10/22/3					
5 300							
5 400	CML(2):60	Br:72	ICI:90's	Courlene:4x36			
5 500	CML(1):60 Ma:90-3 Ma:90-4 Ma:600/2	Co:72 ML:72 TrawlN66: 40000d4ply Nylon6(3):3mm Nylon6.6Comb ML:72	Terylene90's TeryleneHL:6				
5 600				Drumlene:84			
5 700	CHL:72						
5 800	CML(3):72		Terylene:9's/72	Gunlene:27			
5 900		10/24/3	DacronML:60				
6 000		Go:72 Nylon6.6ML:84 Bl:84 Co:84 TrawlN66: 450000d3ply 10/25/3 Go:84 Nylon6(1):3mm ML:84			Drumfil:84 L	nylon:140m/kg	argon:6 mm
6 100							
6 200							
6 300							
6 400							
6 500	CML(2):72						
6 600	CML(1):72 CHL:84 Ma:75-3 Ma:75-4 Ma:750/3				Trawl D		

FRANCE

CANADA

R., tex	Nat	PA	PE	PT	PP	PA	PT
6 700		Br:84 Nylon6(4):3mm 10/27/3	DacronML:72	Drumlène:96	Drumfil:97		
6 800		Nylon6.6HB:72	ICI:70's Terylene:70's				
6 900			Terylene/Nylon ML:84Med				
7 000	CML(3):84						
7 100							
7 200		Nylon6(2):3mm 10/28/3					
7 300		Nylon6(3):3,5 mm					
7 400		ML:96					
7 500		Co:96			Line S		
7 600	CML(3):96 CML(2):84 CHL:96 CML(1):84						
7 700		Go:96		Drumlène:108			argon 5mm
7 800		Nylon6.6ML:96 10/30/3					
7 900		Bl:96	DacronML:84				
8 000							
8 100							
8 200							
8 300	Ma:60-4 Ma:600/3	Br:96 Co:108 ML:108 TrawlN66 600004ply Nylon6(1):3,5 mm	ICI:60's Terylene:60's	Drumlène:120	Drumfil:108		
8 400							
8 500	CHL:108	Nylon6(4): 3,5 mm					
8 600		Go:108	Terylene/Nylon ML:96Med				
8 700	CML(2):86	Nylon6(3):4 mm					

			CANADA			FRANCE		
R..tex	Nat	PA	PE	PT	PP	PA	PT	
8 800	CML(1):96							
8 900								
9 000	CML(3):108	Bl:108 Co:120			Drumfil:120			
9 100								
9 200		Pr:108	DacronML:96					
9 300		Nylon6(2):3,5 mm						
9 400		Co:120						
9 500	CHL:120	ML:120 Nylon6.6ML:108 Nylon6(3):4,5 mm		Drumlene:132				
9 600								
9 700	Ma:510/3	Nylon6(1):4mm	Terylene/Nylon ML:108Med Terylene:50's		Line T N			
9 800	CML(2):108							
9 900	CML(1):108 CML(3):120 Ma:50-4							
10 000		Bl:120						
10 500	CHL:144	Er:120 Co:132 ML:132 Nylon6(4):4mm Bl:132	DacronML:108 Terylene/Nylon ML:120Med	Drumlene:144	Drumfil:132			
11 000	CML(2):120 CML(3):144							
11 500	CHL:156	Nylon6(1): 4,5 mm Nylon6(2): 4 mm Nylon6(4): 4,5 mm Nylon6(3): 5 mm Nylon6.6MB: 132	DacronML:120 TeryleneHL:12			nylon 90 m/kg		
12 000	CML(2):132		Terylene/Nylon ML:132Med		Drumfil:156			

R..tex	CANADA					FRANCE	
	Nat	PA	PE	PT	PP	PA	PT
12 500		Co:156 ML:156 Nylon6(2): 4,5mm		Drumlene:186			
13 000	CML(2):144 CHL:168		DacronML:132				
13 500		Nylon6(1): 5 mm	Terylene/Nylon ML:144Med				
14 000	CML(3): 168	Nylon6(4): 5 mm					
14 500			DacronML:156				
15 000	CML(2):168	Co:192					
15 500		ML:192	Terylene/Nylon ML:168Med				
15 500		Nylon6(2): 5 mm					
16 000			Terylene:30's				
16 500							
17 000			DacronML:192				
17 500							
18 000							
18 500							
19 000							
19 500							
20 000							
20 500		Co:258					
21 000							
21 500		Nylon6(1): 6 mm					
		Nylon6(4): 6 mm					
22 000							
22 500							
23 000							
24 000		Co:294					
25 000		Nylon6(2): 6 mm					
27 500		Co:330					

R..tex	GERMANY		ICELAND		ITALY		NORWAY	
	PA	PE	Nat	PE	PA	PP	PA	PE
5 000	1 G							
5 100	Nt 3/600			BR: 4mm No 180				
5 200								
5 300								
5 400								
5 500								
5 600	2 T	0,23mm x 112						BR: 200/16
5 700								
5 800								
5 900			Ma: 4/85	BR: 4,5mm			BR: 3,0 mm 3/600	
6 000								
6 100								
6 200	Nt 3/500	0,23mm x 128	Ma: 4/80					
6 300								
6 400								
6 500								
6 600								
6 700			Ma: 4/75	No 220				
6 800								
6 900		4 mm						
7 000								
7 100								
7 200								
7 300								
7 400	1 T							
7 500								
7 600	02 G							
7 700								
7 900								
8 000	Nt 3/400			BR: 5mm				
8 100								
8 200								
8 300								9 kilos
8 400								
8 500		5 mm						
8 600								
8 700								

R..tex	GERMANY		ICELAND		ITALY		NORWAY	
	PA	PE	Nat	PE	PA	PP	PA	PE
8 800								
8 900								
9 000								
9 100	02 T							
9 200								
9 300								
9 400								
9 500								
9 600								
9 700								
9 800								
9 900								
10 000								
10 500								
11 000								
11 500								
12 000								
12 500	01 T							
13 000								
13 500								
14 000								
14 500								
15 000								
15 500								
16 000								
16 500								
17 000								
17 500								
18 000								
18 500								
19 000								
19 500								
20 000								

Ma: 4/45

BR: 5,0mm

R..tex	POLAND		PORTUGAL		SPAIN		USSR		UK	
	PA	PE	Nat	PA	PT	PP	PA	Nat	PT	PP
5 000			Ma: 200m/kg							UT. 100
5 100	Steelton:				192 m/kg					
5 200	3,0 mm									
5 300								Capron:		
5 400								3 mm		
5 500								Ma: 90/3		
5 600										
5 700										
5 800										
5 900										
6 000			Si: 175m/kg							
6 100										
6 200					168m/kg					
6 300										U.T. 80
6 400			Ma: 160m/kg							
6 500										
6 600										
6 700										
6 800										
6 900										
7 000	Steelton:									
7 100	3,5 mm									
7 200										
7 300										
7 400										
7 500										
7 600										
7 700										
7 800										U.T. 65
7 900										U. 63

R..tex	POLAND		PORTUGAL		SPAIN		USSR		UK	
	PA	PE	Nat	PA	PT	PP	PA	Nat	PT	PP
8 000		Corfipla- ste: 125 m/kg			125 m/kg					
8 100									15/64	
8 200								Ma: 60/3 Ma: 60/4		
8 300										
8 400										
8 500				Nylon: 5mm			Capron: 4,0mm			
8 600										
8 700										
8 800										
8 900										
9 000										
9 100										
9 200										
9 300										
9 400										
9 500										
9 600		Corfipla- ste: 104m/kg								
9 700										
9 800										
9 900										
10 000										
10 500										
11 000										
12 000										
13 000										
14 000										
15 000										
16 000										
17 000										
18 000										
19 000										
20 000										U. 31

R..tex	USA			
	Nat	PA	PE	PP
5 000		(2):60		
5 100		(3):60		
5 200				96
5 300				BR:72
5 400				
5 500				
5 600		(2):72		
5 700		(1):72		
5 800	C:60	Blend:72		BR:200
5 900				
6 000				
6 100				
6 200				
6 300	Ma:80/4			
6 400		BR:400		
6 500		Blend:84		
6 600		(1):84		
6 700	Ma:75/4	(2):84		
6 800	C:72			
6 900				
7 000		Blend:96		
7 100				
7 200				
7 300				
7 400				
7 500		(1):96		
7 600				
7 700				
7 800	C:84			
7 900		(3):200/3		
8 000				
8 100				
8 200				
8 300			60	
8 400		(1):108		
8 500		(2):96		
8 600				

R..tex	Nat	PA	PE	PP
8 700		BR:215		
8 800		Blend:108		
8 900		(3):403		
9 000		(1):120		
9 100	C:96	(3):3mm		
9 200				
9 300				
9 400				
9 500				
9 600				
9 700		Blend:120		
9 800		(2):108		
9 900				
10 000	C:108			
	Ma:50/4			
10 500		(2):120		
11 000	Ma:45/4	BR:1000		
11 500	C:120	(2):132		
12 000		BR:Medium		
12 500		BR:2		
13 000		(2):168		
13 500		BR:Large		
14 000				
14 500				
15 000				
16 000				
17 000				
18 000				
19 000				
20 000		(2):210		
21 000				
22 000		(2):260		
23 000				

USA

A P P E N D I X

Copies of the original unchanged lists of the
following countries

Canada	9 pages
France	1
Germany	2
Iceland	1
Italy	1
Norway	2
Poland	1
Portugal	1
Spain	1
USSR	1
UK	3
USA	3

R ... tex of North American, Medium Laid, High Tenacity, Type 66
Nylon Twines.

Trade No.	Bluenose	Brownell	Columbian	Gold Medal
No. 12	1063	866	870	841
15	1417	992	1128	1077
18	1772	1352	1418	1360
21	2130	1865	1600	1600
24	2480	2255	1772	1770
27	2830		2157	2200
30	3200	2580	2307	2420
33				
36	3540	2850	2680	2750
42	3910		3100	3420
48	4240	4130	3307	3540
54	4390		3675	3760
60	4730	5060	4315	4310
66				
72	5060	5510	5510	5980
84	6050	6700	6200	6280
96	8000	8270	7630	7870
108	9020	9190	8265	8550
120	10130	10340	9300	9020
132	11020		10630	
156			12400	
192			14880	
222			17510	
258			20670	
294			24000	
330			27550	

E . . . tex of Medium-Laid, Continuous Filament, Polyolefin Twines

Trade No.	Drumlene		Gunlene		Courlene		Drumfil		Ulstron	
	R....tex	Trade No.	R....tex	Trade No.	R....tex	Trade No.	R....tex	Trade No.	R....tex	Trade No.
15 med.	729	3/4	752				15 med.	750	Td.190X30	729
18 "	934						18 "	960	X33	800
21 "	1040						21 "	1000	X36	885
24 "	1143	5/6	1153				24 "	1250	X42	1056
27 "	1352								X45	1103
30 "	1455						30 "	1500	X48	1167
33 "	1560	7/8	1600						X51	1240
36 "	1872	9	1907				36 "	1750	X54	1325
42 "	2185	10/11	2253				42 "	2000	X60	1438
48 "	2504	12	2542				48 "	2250	X66	1570
54 "	2818						54 "	3000	X72	1728
57 "	3120	15/24	3025	3 ply X18 ends	3100		60 "	4000	X81	1945
60 "	3730	18	3720	3 ply X21 ends	3674					
		15/32	4000	3 ply X27 ends	4314				Trawl A	2480
72 "	4680			4 ply X21 ends	5222		72 "	5000	Trawl B	3310
84 "	5615	27	5720	3 ply X36 ends	5512		84 "	6000	Trawl C	4960
96 "	6755						96 "	7000	Trawl D	6610
108 "	7810						108 "	8000		
120 "	8320						120 "	9000	Line N	1033
132 "	9360						132 "	10000	Line P	2157
144 "	10400						144 "	11000	Line Q	3310
							156 "	12000	Line R	4510
168 "	12500								Line S	7630
									Line T	9920

R ... tex of North American Spun Synthetic and Cotton Twines

Trade No.	Soft Laid Nylon		Medium Laid Nylon		Medium Laid Dacron		Soft Laid Cotton		Medium Laid Cotton			Hard Laid Cotton
	Laid Nylon	827	Laid Nylon	1105	Laid Dacron	1105	FRB	Domtex	FRB (1)	Domtex (2)	U.S. Govt. (3)	
12	854	827		1105		1105	852	804	885	873	963	944
15	1044	1102		1578		1578	1108	1071	1105	1093	1196	1181
16												
18	1256	1328		1642		1642	1385	1541	1327	1313	1460	1417
20												
21	1460	1550		1938		1938	1663	1611	1548	1532		1653
24	1670	1771		2215		2215	1940	1879	1770	1746	1908	1886
27		2010		2515		2515			1990	1970		2128
28												
30	2084	2220		2780		2780	2217	2149	2210	2186	2480	2361
32							2495	2409	2655	2625	2920	2833
36	2505	2680		3345		3345	2770	2682				
40												
42	2920	3165		3960		3960	3050	2953	3100	3060		3306
44							3325	3222				
48	3530	3630		4540		4540			3540	3493	3970	3785
54	3760	4080		5080		5080			3980	3940		4240
60		4540		5860		5860			3520	3410		4725
72		5470		6825		6825			6620	6490	5840	5670
84		6410		8000		8000			7730	7575	7090	6610
96		7370		9185		9185			8830	8660	7630	7560
108		8270		10330		10330			9940	9750	9020	8500
120		9300		11020		11020				10840	9925	9445
132		10620		12940		12940				11900	11030	10400
144										12990		11320
156		12400		14880		14880						
168												
180												
192		14880		17500		17500				15180	14180	13220

R ... tex of Japanese Manryo and Cotton Twines

Trade No.	Soft Laid Manryo	Medium Laid Manryo				Medium Laid Cotton
		FRB	Kurashiki	Nippon Gyomo	Trawlton	
Ne 20/18		634	621	627		613
/21		740	725	738	758	
/24		846	827	836	870	870
/27		951		946		
/30		1057	1031		1099	1103
/32	1084					
/36	1220		1235	1269	1316	
/40	1356					
/42					1587	1438
/44	1492					
/45			1550	1600		
/48	1627				1754	
/51				1824		
/52	1763					
/56	1898					
/60	2034		2062			
/63					2326	
/64	2170					
/66				2373		
/72	2440					
/75			2600		2778	
/84				2969		
/90					3226	

R ... tex of British, Medium Laid, Continuous Multifilament, Twines.

Gundry Type 66, cmf, Nylon		Kenlon Type 66, cmf, Nylon		Trawl Type 66, cmf, Nylon		ICI, cmf, Terylene		Manila and Sisal Trawl Twines	
Trade No.	R...tex	Trade No.	R...tex	Trade No.	R...tex	Trade No.	R...tex	Trade No.	R...tex
108	735	567	729			Td.250X24	708	150-3	3307
120	827					X27	827	125-3	3968
144	954	756	982			X30	918	112½-3	4409
		945	1209			X33	1013	100-3	4961
240	1772	1260	1653			X36	1115	90-3	5512
300	2205	1512	1983			X39	1210	75-3	6614
		1890	2480			X42	1289		
360	3010					X45	1379	100-4	4961
				30000 d	4132	X48	1460	90-4	5512
				3 ply		X51	1576	75-4	6614
				40000 d	5510	X54	1645	60-4	8267
				4 ply		X57	1760	50-4	9921
				45000 d	6200	X60	1873		
				3 ply					
				60000 d	8265	X66	2033		
				4 ply		X72	2215		
						X81	2480		
						110's	4510		
						90's	5510		
						70's	7090		
						60's	8270		

R ... tex of Medium Laid Twines Made from 210 d., Type 6 Nylon Yarn.

Trade No.	Nippon Gyomo	Jap. "Grilon"	Momoi	Uroko	Apel-doorn	Nylon-Endlos
Td 210dX30		763	787	811	769	769
X33		842			867	833
X36	913	920	954	984	936	
X39		1013			1023	
X42		1098	1128	1210		
X45	1146	1196		1212		
X48			1305		1250	
X51	1312	1386	1405	1450		
X54			1472			1563
X60		1632	1654	1633	1600	
X66	1735	1798	1830	1900		
X72					1910	
X75		2042	2093			
X81		2166				
X84	2275					
X90		2470				
X96						
X99			2820			
X108						
X120		3140				
X135			3815			

R ... tex of Braided, Continuous Filament Fishnet Twines.

		Type 6 Nylon				Terylene		Ulstron	
		Fine Braid		Coarse Braid		Coarse Braid			
Trade No.		No core	with core	No core	with core	Trade No.	R...tex	Trade No.	R...tex
2 mm	1887	2410	1753	2275	240's	2067	E	1654	
2½ mm	4000	4550	3570	4240	140's	3540	F	1984	
3 mm	6280	7190	5570	6700	115's	4310	G	2480	
3½ mm	8270	9180	7290	8550	90's	5510	H	3420	
4 mm	9920	11540	8700	10120	70's	7090	J	3970	
4½ mm	11540	12400	9540	11270	60's	8260	K	4960	
5 mm	13410	15500	11820	14170	50's	9920	L	6200	
6 mm	21570	24800	17720	21570	30's	16540	M	9920	

R ... tex of Miscellaneous Fishnet Twines.

Terylene Cont. Multifil. Hard Laid		Nylon 6.6 Textured Medium Laid		Terylene/Spun Nylon Combination Medium Laid	
No.	R...tex	No.	R...tex	No.	R...tex
1	936	12	Med.TN 787	48	Med. 3330
2	1980	15	" " 1246	60	" " 4865
3	2835	18	" " 1709	72	" " 6160
4	3970	21	" " 2155	84	" " 7290
6	5510			96	" " 8550
12	11020			108	" " 9580
				120	" " 10600
				132	" " 12170
				144	" " 13630
				168	" " 15710

Nylon 6.6 Continuous Multifilament Hard Braid		Nylon 6.6 Textured Medium Braid		Marlon Medium Laid	
No.	R...tex	No.	R...tex	No.	R...tex
36	2185	12	755	M-6	533
42	3650	15	1460	M-8	737
48	3970	21	1785	M-10	954
72	6980	30	2650	M-14	1338
		36	3540		
		84	5980		
		132	11820		

Nylon 6.6 Textured Soft Laid		Nylon 6.6 Combination Medium Laid		Nyak Medium Laid	
No.	R...tex	No.	R...tex	No.	R...tex
TN-6	699	12	908	9	659
TN-7	818	15	1167	12	894
TN-8	936	21	1693	15	1204
TN-12	1406	30	2397	18	1477
TN-16	1872	36	2760	21	1570
		48	3730		
		60	4960		
		72	5640		
		96	7870		
		108	9360		

R ... tex of Miscellaneous Fishnet Twines.

Spun Terylene Soft Laid		Spun Ulstron Medium Laid		Spun Nylon Medium Laid		Spun Nylon Medium Braid	
No.	R...tex	No.	R...tex	No.	R...tex	No.	R...tex
Ne 9's/15	1201	U	826	Ne 10/3/3	620	No. 15	1110
9's/24	2018	V	1503	10/4/3	849	No. 21	1447
9's/30	2443	W	1772	10/5/3	1069		
9's/45	3470	X	2680	10/6/3	1298	No. 15	1086
9's/60	4770	Y	3420	10/7/3	1531	No. 21	1202
9's/72	5835	Z	4130	10/8/3	1746		
				10/9/3	2000	No. 12	535
				10/10/3	2234	No. 16	1006
				10/11/3	2467	No. 20	1490
				10/12/3	2710		
				10/13/3	2970		
				10/14/3	3200		
				10/15/3	3493		
				10/16/3	3758		
				10/17/3	4000		
				10/18/3	4240		
				10/19/3	4510	900/2	3675
				10/20/3	4770	750/2	4390
				10/21/3	5060	600/2	5510
				10/22/3	5330	750/3	6615
				10/24/3	5900	600/3	8270
				10/25/3	6200	510/3	9725
				10/27/3	6790		
				10/28/3	7190		
				10/30/3	7870		

U.S.A. Spec.
Laid Manila
Trawl Twines

No.	R...tex
900/2	3675
750/2	4390
600/2	5510
750/3	6615
600/3	8270
510/3	9725

France

Material	Twine construction	Trade name	Trade number	runnage m/kg	R.. tex (g/1000 m)
Polyamide	twisted	nylon		90	11 110
				140	6 140
				280	3 570
Polyethylen	plaited	argon	4 mm	162	6 170
			5 mm	127	7 870

1. Deepsea trawlers

Material	Twine- construction	Trade number	runnage m/kg	R..tex (g/1000 m)
Polyamide	twisted	Nt 3/400	125	R 8000 tex
"	"	Nt 3/500	161	R 6200 tex
"	"	Nt 3/600	196	R 5100 tex
Polyamide	plaited	01 T	80	R 12500 tex
"	"	02 T	110	R 9100 tex
"	"	02 G	132	R 7600 tex
"	"	1 T	135	R 7400 tex
"	"	2 T	179	R 5600 tex
"	"	1 G	200	R 5000 tex
Polyethylene	plaited	∅ 5 mm	121	R 8260 tex
"	"	0,23 mm x 128	160	R 6260 tex
"	"	0,23 mm x 112	179	R 5600 tex
(Polyethylene	twisted	0,23 mm x 96	221	R 4520 tex)
"	"	∅ 4 mm	146	R 6850 tex

2. Small trawlers

Material	Twine- construction	Trade number	number metric	runnage m/kg	R...tex (g/1000 m)
Polyamide	twisted	Td 210 x 9	Nm 43/9	4350	R 230 tex
"	"	Td 210 x 12	Nm 43/12	3230	R 310 tex
"	"	Td 210 x 15	Nm 43/15	2560	R 390 tex
"	"	Td 210 x 18	Nm 43/18	2220	R 450 tex
"	"	Td 210 x 21	Nm 43/21	1890	R 530 tex
"	"	Td 210 x 27	Nm 43/27	1450	R 680 tex
"	"	Td 210 x 33	Nm 43/33	1200	R 830 tex
"	"	Td 210 x 36	Nm 43/36	1100	R 910 tex
"	"	Td 210 x 39	Nm 43/39	1000	R 1000 tex
"	"	Td 210 x 48	Nm 43/48	810	R 1230 tex
"	"	Td 210 x 60	Nm 43/60	630	R 1580 tex
"	"	Td 210 x 72	Nm 43/72	540	R 1860 tex

Iceland.Trawl twines used in commercial trawls.

Material	twisted or braided	Trade number	m/kg	R.	tex
Manila	twisted	4/45	90	R	11100 tex
-	-	4/70	140	R	7100 tex
-	-	4/75	150	R	6700 tex
-	-	4/80	160	R	6250 tex
-	-	4/85	170	R	5800 tex
Polyethylene	twisted	41-42	770	R	1300 tex
-	-	60	530	R	1890 tex
-	-	72	470	R	2130 tex
-	-	84	415	R	2410 tex
-	-	96	370	R	2705 tex
-	-	120	290	R	3450 tex
-	-	160	210	R	4760 tex
-	-	180	190	R	5265 tex
-	-	220	150	R	6665 tex
Polyethylene	braided	4 mm	192	R	5208 tex
-	-	4,5 mm	168	R	5952 tex
-	-	5 mm	125	R	8000 tex

Material	Twisted or braided or linear	Trade number	m/gr.	m/kg.	yard/lb	R...tex
Meraklon	linear	Td 200/2 twines	0,049	20.408	10.138	R 49 tex
"	"	200/3 "	0,075	13.333	6.623	R 75 "
"	"	200/4 "	0,101	9.900	4.918	R 101 "
"	"	200/6 "	0,148	6.756	3.356	R 148 "
"	"	200/9 "	0,228	4.385	2.178	R 228 "
"	"	200/12 "	0,318	3.144	1.561	R 318 "
"	"	200/15 "	0,391	2.557	1.270	R 391 "
"	"	1200/6 "	0,992	1.008	500	R 992 "
"	"	1200/12 "	1,925	519	257	R 1925 "
"	"	1200/15 "	2,244	445	221	R 2244 "
"	"	1200/18 "	2,710	369	183	R 2710 "
Nylon	"	Td 210/1 Twine		42.500		R 23,5 tex
"	"	210/2 "		42.500		R 47 "
"	"	210/3 "		42.500		R 70,5 " 70,5
"	"	210/6 "		42.500		R 141 "
"	"	210/9 "		42.500		R 211,5 " 211,5
"	"	210/12 "		42.500		R 282 " 282
"	"	210/21 "		42.500		R 493,5 " 493,5
"	"	210/27 "		42.500		R 634,5 " 634,5
"	"	210/33 "		42.500		R 775,5 " 775,5
"	"	210/48 "		42.500		R 1128 " 1128
"	"	210/60 "		42.500		R 1410 " 1410
"	"	210/72 "		42.500		R 1692 " 1692
"	"	210/96 "		42.500		R 2256 "

See letter 3
21 May 65 from Italy
+ letter 3 25 June 65
from Lancaster
for above
changes

Trade numbers etc. of trawl twines used in Norway

Polyamid

a) Twisted

Trade No.	Nm	R..tex
4	3.2	312
5	2.5	400
6	2.1	476
7	1.8	555
8	1.55	645
9	1.35	740
10	1.25	800
11	1.15	870
12	1.10	910
13	0.95	1050
14	0.90	1111
15	0.85	1176
16	0.80	1250
3/600	0.165	6060
3/750	0.225	4444
3/900	0.265	3773

b) Braided

Trade No.	Nm	R..tex
1.8 m/m	0.355	2817
3.0 m/m	0.17	5880
4.0 m/m	0.13	7690
5.0 m /m	0.07	14285
Nm 0.27	0.27	3703

Polyester

Twisted

Trade No.	Nm	R..tex
9 kilos	0.12	8333
2 1/2 "	0.43	2325
1 3/4 "	0.617	1620
1 1/4 "	0.86	1162
5	2.15	465
6	1.80	555
8	1.35	740
9	1.20	833
10	1.08	925
12	0.90	1111

Trade numbers etc. of trawl twines used in Norway

Polyethylen

a) Twisted

<u>Trade No.</u>	<u>Nm</u>	<u>R... tex</u>
75/15	2.0	500
75/18	1.62	617
75/21	1.46	685
75/24	1.25	800
0.38/15	0.54	1852
0.38/21	0.30	3333

Polypropylen

a) Twisted

<u>Trade No.</u>	<u>Nm</u>	<u>R... tex</u>
0.25/27	0.67	1490
0.25/45	0.39	2564

b) Braided

270/16	0.23	4350
200/16	0.18	5555

Cotton

Twisted

<u>Trade No.</u>	<u>Nm</u>	<u>R... tex</u>
Ne 12/9 Z	1.8	555
Ne 12/15 Z	1.08	925

Poland

<u>Name of Material</u>	<u>Diameter in mm</u>	<u>Den. (still used)</u>	<u>Den. (used in progress)</u>	<u>R..tex</u>
Steelon	2.5	265/6x5x3	840/3x3x3	R 3400 tex
"	3.0	265/6x8x3	840/5x3x3	R 5200 tex
"	3.5	265/6x11x3	840/7x3x3	R 7000 tex

Material	Twine- construction	Tradename	runnage m/kg	Retex (g/1000 m)
Polyethylene	plaited	Corfiplaste (Green)	150	6600
			125	8000
			104	9610

Material	Torcido o Trenzado	Número de Fábrica	Longitud Total del hilo m/Kg	R	
				(g./ 1000 m)	Tex
Abacá	Torcido	---	160	R. 6.250	Tex
"	"	---	200	R. 5.000	Tex
Nylon	Trenzado	---	270	R. 3.703	Tex.
"	"	---	105	R. 9.523	Tex.
"	"	---	130	R. 7.692	Tex.
"	"	---	180	R. 5.555	Tex.
"	"	---	90	R. 11.111	Tex.
"	"	4 mm	156	R. 6.410	Tex
"	"	5 mm	117	R. 8.547	Tex.
"	"	6 mm	97	R. 10.309	Tex.
Poliétileno	"	---	192	E. 5.208	Tex
"	"	---	168	R. 5.952	Tex
"	"	---	125	R. 8.000	Tex
Polypropylene	"	4 mm	167	R. 5.988	Tex
Sisal	Torcido	---	175	R. 5.714	Tex

Spalt

List of all the trade numbers of trawl twines used
in USSR with the corresponding m/kg and resultant
tex for each twine size

Material	twisted of braided	Trade number	runnage of the whole twine m/kg	R.. tex (g/1000 m)
Capron	twisted	Nm 34/48	572	R 1730 tex
"	"	Nm 10,7/18	585	R 1967 tex
"	"	Nm 34/72	400	R 2500 tex
"	"	Nm 10,7/36	381	R 2622 tex
"	"	3 mm	217	R 4600 tex
"	"	3 mm	182	R 5500 tex
"	"	3,5 mm	152	R 6600 tex
"	"	4,0 mm	118	R 8500 tex

Resultant Tex of Netting Twines
used for Cod Ends by British Vessels
in the ICNAF area

UK 1

Table 1. Manila and Sisal

Trade No.	Runnage yd/lb	R. tex	Remarks
Twisted 3 strands			
175 /3	175	2836	
150 /3	150	3308	
125 /3	125	3970	
112½/3	112½	4411	
100 /3	100	4963	
90 /3	90	5514	
75 /3	75	6617	
60 /3	60	8271	
50 /3	50	9925	
Twisted 4 strands			
75 /4	75	6617	
60 /4	60	8271	
50 /4	50	9925	

Table 2. Nylon Multifilament

Trade No.	Runnage yd/lb	R. tex	Remarks
Twisted 210 Denier Yarn			
210x30	610	813	Many manufacturers drop the prefix 210
36	490	1013	
48	370	1341	
60	300	1654	
72	240	2068	
756	505	983	Here the trade number is 210 x number of yarns + 10
945	410	1210	
1260	300	1654	
1512	250	1985	
1890	200	2481	
Twisted - ^R Hand Lay			
143	380	1306	<i>Here the trade number denotes 14 x 3 yarns of 210 denier in the complete twine; 14 yarns in each strand etc.</i>
203	260	1909	
243	220	2256	
283	180	2757	
363	150	3308	
403	135	3676	
443	120	4136	
403	115	4315	

Table 3. Polyethylene

Trade No.	Runnage yd/lb	R. tex	Remarks
75/30	480	1034	The sizes of the original yarn are 0.01" diameter (ten thou.) or
75/36	416	1193	
70 ⁵ /42	350	1418	0.015" 0.015" (fifteen thou.)
10/24	384	1292	Some manufacturers also use 0.0075".
10/27	350	1418	All leading makers describe twines as filament size (10, 15 or 75)
10/30	288	1723	
10/36	244	2034	then the number of filaments and
10/42	224	2215	some add the number of strands,
10/48	192	2585	e.g. 10/36/3.
10/60	144	3446	
15/12	310	1601	
15/15	260	1909	
15/16	242	2050	
15/18	220	2256	
15/21	195	2545	
15/24	170	2919	
15/32	124	4002	
15/36	110	4512	
15/48	80	6203	
15/64	60	8271	

Table 4. Polypropylene

'Ulstron' by I.C.I. is supplied to twine makers as yarn of 190, 380, 570, etc. denier. Made into twine it may be described as 190/number of yarns in each strand, or yards per lb like sisal and manila.
or in the completed twine,

Trade No.	Runnage yd/lb	R. tex	Remarks
Ulstron Twisted			
190/36	560	886	
39	510	973	
42	470	1056	
45	450	1103	
48	425	1168	
51	400	1241	
54	375	1323	
60	345	1438	
66	316	1570	
72	287	1729	
81	255	1946	
12	550	902	Here trade number is number of 190 denier yarns in each strand. So No. 12 = 190/36.
15	460	1079	
21	310	1601	
36	180	2757	
42	155	3202	
60	105	4726	
U.T. 600	600	827	U.T. is 'Ulstron' twisted and trade number is the runnage. No clue as to the make up of the twine is given.
360	360	1378	
280	280	1772	
245	245	2026	
200	200	2481	
175	175	2836	
150	150	3308	
125	125	3970	
100	100	4963	
80	80	6203	
65	65	7635	
P. 123	570	870	Here trade number is P = polypropylene, 123 = 12 yarns per strand, 3 strands.
183	350	1417	
243	260	1909	
303	210	2363	
363	175	2836	
Plaited Ulstron			
U. 31	31	16009	All leading twine makers describe their plaited Ulstron in <u>runnage</u> .
63	63	7878	
76	76	6530	
110	110	4512	
120	120	4135	
145	145	3423	
185	185	2683	
200	200	2481	
315	315	1575	

MATERIAL	TWISTED OR BRAIDED	TRADE NUMBER	RUNNAGE OF THE WHOLE	
			TWINE	R..Tex (g/1000m)
			yds/lb.	
Cotton	Twisted	#21	316.67	1570
"	"	#24	266.67	1860
"	"	#27	233.34	2130
"	"	#30	216.67	2290
"	"	#36	181.67	2730
"	"	#42	153.34	3240
"	"	#48	133.34	3720
"	"	#54	120.	4140
"	"	#60	88.34	5620
"	"	#72	74.34	6680
"	"	#84	63.34	7840
"	"	#96	54.34	9130
"	"	#108	49.	10120
"	"	#120	43.34	11450
Manila	Twisted	45/4	45.	11030
"	"	50/4	50.	9920
"	"	75/4	75.	6620
"	"	80/4	80.	6200
Polypropylene	Twisted	#24	370.	1340
"	"	#30	292.	1700
"	"	#36	236.	2100
"	"	#42	207.	2400
"	"	#48	186.	2670
"	"	#54	162.	3060
"	"	#60	143.	3470
"	"	#72	116.67	4250
"	"	#96	93.34	5320
Polypropylene	Braided	#24	283.34	1750
"	"	#36	190.	2620
"	"	#54	138.34	3590
"	"	#72	93.34	5320
"	"	#200	74.02	6700
Polyamide (Blends)	Twisted	#21	320.	1550
"	"	#24	262.	1890
"	"	#27	235.	2110
"	"	#30	206.	2410
"	"	#36	175.	2840
"	"	#42	149.	3330
"	"	#48	139.	3570
"	"	#54	113.	4390
"	"	#60	109.	4550
"	"	#72	85.	5840
"	"	#84	78.	6360
"	"	#96	70.	7090
"	"	#108	56.	8860
"	"	#120	51.	9730

Page #2

MATERIAL	TWISTED OR BRAIDED	TRADE NUMBER	RUNNAGE OF THE WHOLE TWINE yds/lb.	R...Tex (g/1000m)
Polyamide	Twisted (1)	#21	320.	1550
"	"	#24	285.	1740
"	"	#27	231.67	2140
"	"	#30	203.34	2440
"	"	#36	176.67	2810
"	"	#42	148.34	3350
"	"	#48	130.	3820
"	"	#54	125.	3970
"	"	#60	115.	4320
"	"	#72	86.67	5720
"	"	#84	75.	6620
"	"	#96	65.	7630
"	"	#108	58.34	8500
"	"	#120	55.	9020
Polyamide	Twisted (2)	#21	286.67	1730
"	"	#24	242.67	2050
"	"	#30	210.	2360
"	"	#36	180.	2760
"	"	#42	162.	3060
"	"	#48	126.67	3920
"	"	#60	98.34	5040
"	"	#72	88.	5640
"	"	#84	72.67	6830
"	"	#96	58.34	8500
"	"	#108	50.	9930
"	"	#120	45.67	10870
"	"	#132	41.67	11920
"	"	#168	35.	14180
"	"	#210	25.	19850
"	"	#260	21.67	22900
Polyamide	Twisted (3)	#18	312.	1590
"	"	#30	225.	2210
"	"	#18	313.34	1445
"	"	#30	190.	2610
"	"	#36	165.	3010
"	"	#60	94.67	5240
"	"	3 m/m	53.20	9330
"	"	200/3	62.	8000
"	"	400/3	129.	3850
Polyamide	Braided	#2	38.89	12760
"	"	#400	78.38	6330

Page 3 MATERIAL	TWISTED OR BRAIDED	TRADE NUMBER	RUNNAGE OF THE WHOLE TWINE	R...Tex yds/lb. (g/1000m)
Polyester	Braided	#60	60.	8270
Polyethylene	Braided	(Unknown)	119.23	3320
"	Twisted	#18	119.38	1180
Polyamide	Braided	(Unknown)	32.61	15200
"	"	Large	35.18	14000
"	"	Medium	40.35	12300
"	"	#1000	42.89	11570
"	"	#215	86.05	5760
"	"	#315	110.68	4480
"	"	#550	155.38	3190
"	"	Unknown	79.26	6260