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THE PRESERVATION OF FISHING NETS, TRAWL TWINES AND FIBRE ROPES FOR USE IN SEA WATER

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This paper is a continuation of our publication, in 1941, of exposure tests interrupted by the war. As no sea-water basin was available till recently the work was delayed, and in the post-war confusion several mixtures intended for trial unfortunately got mislaid. During the war, however, one of us started water-absorption tests which have proved interesting and appear to be more useful for work in the sea than the British Standards Institute tests, which extend only to 6 hr. immersion; this is far too short a period for some purposes.

TABLE I. WATER ABSORPTION TESTS ON SISAL ROPE IN SEA WATER

The numbers represent percentage absorbed.

February 1943	Immersion period (hr.)					Diameter (cm.)	
	0·5	5	24	48	96	Initial	Final
Untreated	53	53	54	58	59	8·2	8·6
Emulsion treated	.	28	55	52	.	9·4	10·2
Waterproofed	.	12	26	38*	.	8·7	9·8
Above repeated after 22 days air-drying, till constant							
Untreated	.	.	.	38	64	8·6	8·8
Emulsion treated	.	.	.	48	54	9·8	9·9
Waterproofed	.	.	.	39	42	10·2	10·2

Percentages here are calculated on the dry weight after immersion.
* 72 hr. All 6 ft. with ends bound with hemp string.

WATER ABSORPTION TESTS

Table 1 shows the absorption of water by sisal rope—the only fibre then available—untreated and after commercial treatments with emulsion and waterproofing. The emulsion treated was indistinguishable from the untreated after 1 day, whereas the waterproofing still showed a lesser uptake after 3 days. But with a second immersion the differences varied irregularly.

Table II records the percentage uptake of Cuprinol and of tar by manila, sisal and coir ropes 3 in. in circumference, also the uptake with commercially waterproofed manila and sisal. Dry weights of preservative are also shown and the weight of preservative remaining after drying and slow draining, calculated as a percentage of the wet weight after treatment. There is little difference

between the final water uptake of manila and sisal, but the 'waterproofed' ropes ultimately absorb more water than the untreated, and the same holds for preservatives. Coir takes up more than twice as much water as the other two. But the treatment of manila, waterproofed manila and sisal with the preservatives fails to make the ropes heavy in water, for the water absorption is reduced by approximately the weight of the preservative taken up. There

TABLE II

Sample no.	Treatment, May 1950	Pre-servative wet wt. (%)	Pre-servative dry wt. (%)	Pre-servative residue (%)	Sea water absorbed (%)		Water + preservative % on untreated
					1 day	15 days	
1	Manila 3 in. dry	.	.	.	.	.	.
2	Do. untreated	.	.	.	35	45	45
3	Do. Cuprinol	11	3	28	31	41	44
4	Do. tar	21	17	84	14	29	46
5	Manila 3 in. water-proofed, dry	.	.	.	.	.	.
6	Do. untreated	.	.	.	26	48	48
7	Do. Cuprinol	13	6	45	28	44	50
8	Do. tar	21	18	84	16	34	51
9	Sisal 3 in. dry	.	.	.	.	.	.
10	Do. untreated	.	.	.	37	44	44
11	Do. Cuprinol	16	7	42	34	40	46
12	Do. tar	26	23	87	15	26	49
13	Sisal 3 in. water-proofed, dry	.	.	.	.	.	.
14	Do. untreated	.	.	.	47	55	55
15	Do. Cuprinol	22	11	50	43	52	63
16	Do. tar	38	33	87	17	31	64
17	Coir 3 in. dry	.	.	.	.	.	.
18	Do. untreated	.	.	.	88	117	117
19	Do. Cuprinol	49	31	63	77	89	120
20	Do. tar	79	72	90	49	75	147

is some increase with waterproofed sisal when tarred. In the foregoing the ends of all ropes were whipped as usual with hemp twine, but were not sealed, as this is not customary in fishing vessels. Samples shown as 'untreated' means no further treatment after receipt from the factory. The tar treatment was cold immersion for 48 hr. (31 May 1950) by courtesy of the Plymouth branch of the Gourock Ropework Co. The netting was allowed to drain for 1 day. Cuprinol samples were immersed for 18 hr. (30 May 1950) and weighed wet after 4 hr. draining; they were then air dried till constant in weight after 47 days, and placed in sea water 18 July 1950, till saturated.

Table III shows the results of tap water absorption tests on the untreated dry controls of Table II. Duplicate tests were made in April 1952, the ends being also sealed, with Berry's bitumastic rubber compound. The B.S.I. test (1946, no. 908) specifies for waterproofing 1 hr. immersion, wiping dry and immersion for 5 hr. more. Though a 6 hr. test shows benefit from water-proofing and a decreasing effect is shown for 1, 2 and perhaps 3 days, with

longer immersion no difference is apparent. With so much water and preservative held in the interstices it is obvious that exact percentage duplications are not to be expected, but the absorptions of the untreated fibres agree reasonably well in the various tables.

TABLE III. WATER ABSORPTION TESTS ON ROPES

(B.S.I. 1946 No. 908 specification but continued longer. April, 1952. The numbers represent percentage absorbed.)

Sample no.	Sample	Immersion period (hr.) 1	6	24	48	72	120	144
1	Manila 3 in.	28	35	41	45	49	51	51
5	Do. waterproofed	8	18	29	38	43	49	49
9	Sisal 3 in.	39	40	44	45	48	49	48
13	Do. waterproofed	12	19	29	40	47	53	52
17	Coir	90	86	108	110	120	126	120

DURABILITY TESTS

It is difficult to devise an exposure test which shall be of real value as indication of usefulness on nets, trawl twines and ropes. One can only arrange the methods in order under the conditions of test selected or imposed by nature. Tests on ropes in Plymouth Sound, on the old Hoe pier, now destroyed, were valuable, as the polluted water was a good sample of harbour conditions and pollution in fishing gear. The water in the basin at Pier Cellars is far purer. At times, however, fouling occurs from drifting seaweed. Though samples cannot there be stolen, they can be washed away in heavy weather. The tests tend to become a measure of the solubility of the preservative, as against a life for the untreated specimen far longer than under harbour conditions.

In the present series the best of the earlier treatments, see Atkins & Purser (1936), copper naphthenate (Cuprinol), and the quite good treatment—save for ropes—recommended by Dr Olie were tested against a few others. Olie's method (see Atkins, 1936) is cheap and easily applied and many millions of sand bags were thus preserved during the war.

The specimens were suspended in the basin so as to be out of the water for 4–6 hr. every tide. In spite of what seemed secure fixing most of one set of trawl twines and one entire set of ropes were washed away.

The specimens were inspected once a fortnight or once a month and were tested by hand.

On cotton netting aluminium stearate in petrol did surprisingly well in duplicate tests, and ranked with the copper soaps, the best of which lasted 9 months, but Olie's treatment was so near as to have advantages on general grounds. On the trawl twines the British Columbia grade of Cuprinol was easily the best, and lasted 16 months. Among the ropes the four Cuprinol

samples, including two diluted with Coalite oil, low-temperature distillation, an American ammoniacal copper and novenate copper in petrol are still under test after 16 months.

TABLE IV. DURABILITY OF SAMPLES IMMERSED IN SEA-WATER BASIN, NEAR CAWSAND, PLYMOUTH SOUND

Sample no.		Cotton netting (%)	Trawl twines (%)	Sisal rope (%)
1	Untreated: kept in dark in laboratory	•	•	•
2	immersed	100	100*	100
3	Cuprinol: standard grade	167	121	++
4	British Columbia grade	162	183	++
5	Copper N.H. 8	128	138	++
6	Aluminium stearate: 1 lb. to 1 gal. benzole	134	100*	100
7	1 lb. to 1 gal. Coalite oil	128	106*	123
8	1 lb. to 1 gal. petrol	162	100*	100
9	Novenate copper: 1 lb. to 1 gal. benzole	162	121	129
10	1 lb. to 1 gal. Coalite oil	145	106	127
11	1 lb. to 1 gal. petrol	150	106	++
12	Cuprinol: with equal volume Coalite oil	133	121	++
13	1 vol. with 3 vol. Coalite oil	150	106	++
14	Olie's treatment	150	106	123
	Life of untreated in days	164	265	382

Samples immersed in Pier Cellars tidal basin 21 February 1951.
Cotton 14 S/6-ply, white, 2½ in. mesh. Mean of duplicate sets.
Trawl twine, manila, 3-ply, 150 yd/lb. Duplicate set washed away 9 January 1952; only specimens showing result of duplicate tests have * mark. Sisal rope was ⅞ in. six thread.
One set of ropes washed away, 26 February 1952, before any failed; sound after 493 days marked ++.

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SUMMARY

A trade waterproofing of sisal rope had still some effect after 3 days in sea water, the untreated being four-fifths saturated in 1 hr.

Treating manila, sisal and coir rope with Cuprinol or tar increases the wet weight at the most only slightly as less water is taken up than without preservative.

Water equilibrium is not attained till long after the B.S.I. specification test period for waterproofing sisal rope, but some effect of waterproofing may be distinguished up to perhaps 3 days.

On cotton netting copper naphthenate preservatives were most durable in a clean sea-water basin, but Dr Olie's method with cutch and ammoniacal copper sulphate ran them close and is cheaper. The best lasted 9 months as against untreated 5½ months.

On trawl twines the British Columbia grade of Cuprinol, a proprietary mixture containing copper naphthenate, was the best of those tried, and the twines lasted 16 months as against almost 9 for untreated manila.

On thin sisal rope six copper preparations are still under test.

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