



BEXCO



Testing of Deeprope®

P. Van Den Berghe



Overview

- Scope & Purpose
- Rope Tests Evaluations
- Tests performed by Bexco
- Conclusions & questions



Scope & Purpose

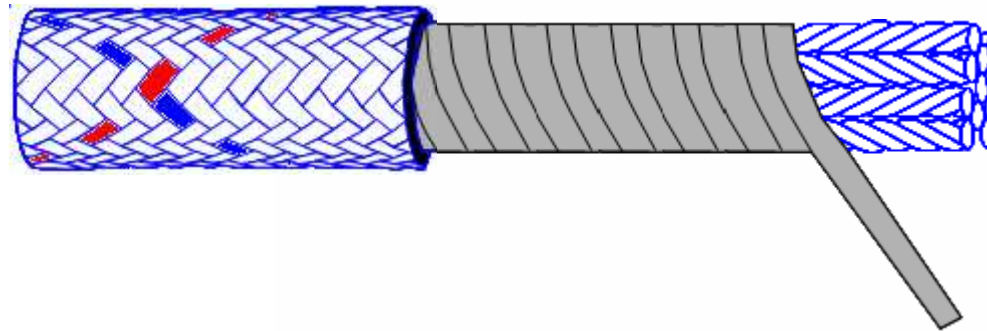
Give insight in :

- rope parameters influencing mechanical characteristics
- relationships between rope parameters and behaviour of the rope as established for the Bexco DeepRopes®

Aim is : to question whether in case of similar rope designs all testing is required for every project



Bexco DeepRope® construction



- Subropes : 3 strand, polyester (Diolen or Performance Fibers), # subropes dependent on tensile strength to be achieved
- Sandfilter : tested according to ET 3000.00-6651-962-PGT-001
- Cover : polyester yarn, non-load bearing

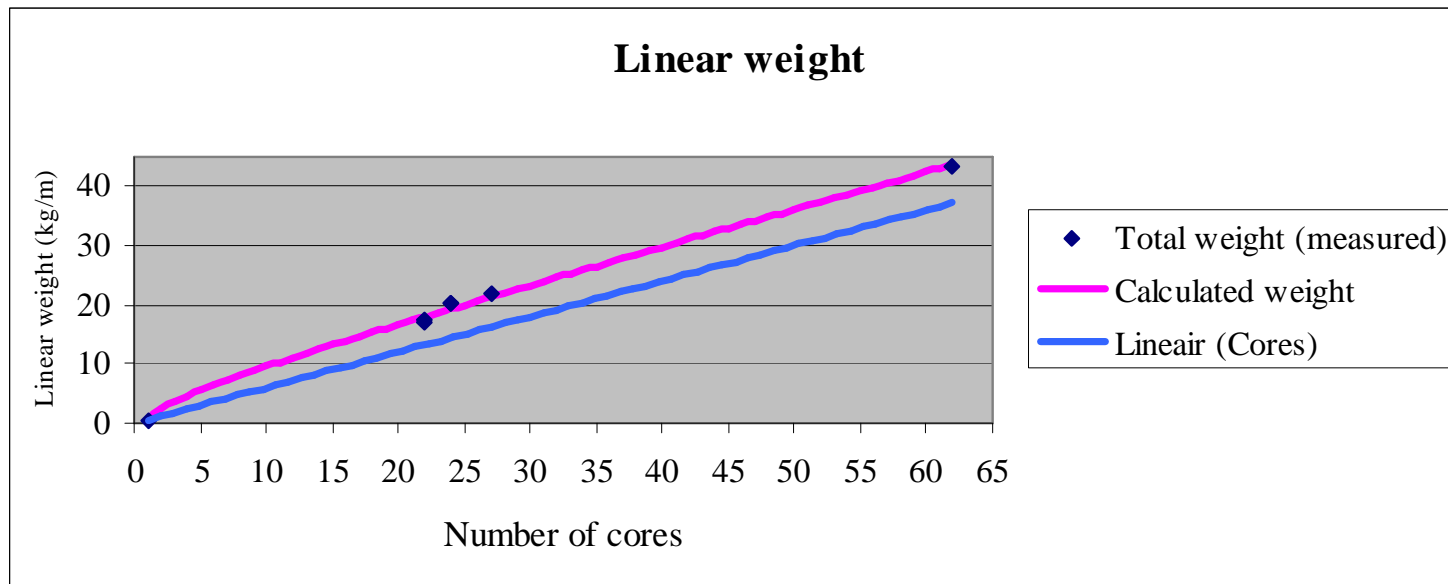
Subropes raw material	Polyester Diolen
	Polyester Performance Fibers
Construction of subropes	3 strand
# Subropes	Dependent on MBL required
Sandfilter	3 layers, material unchanged



Rope tests : Linear Weight

Influencing parameters :

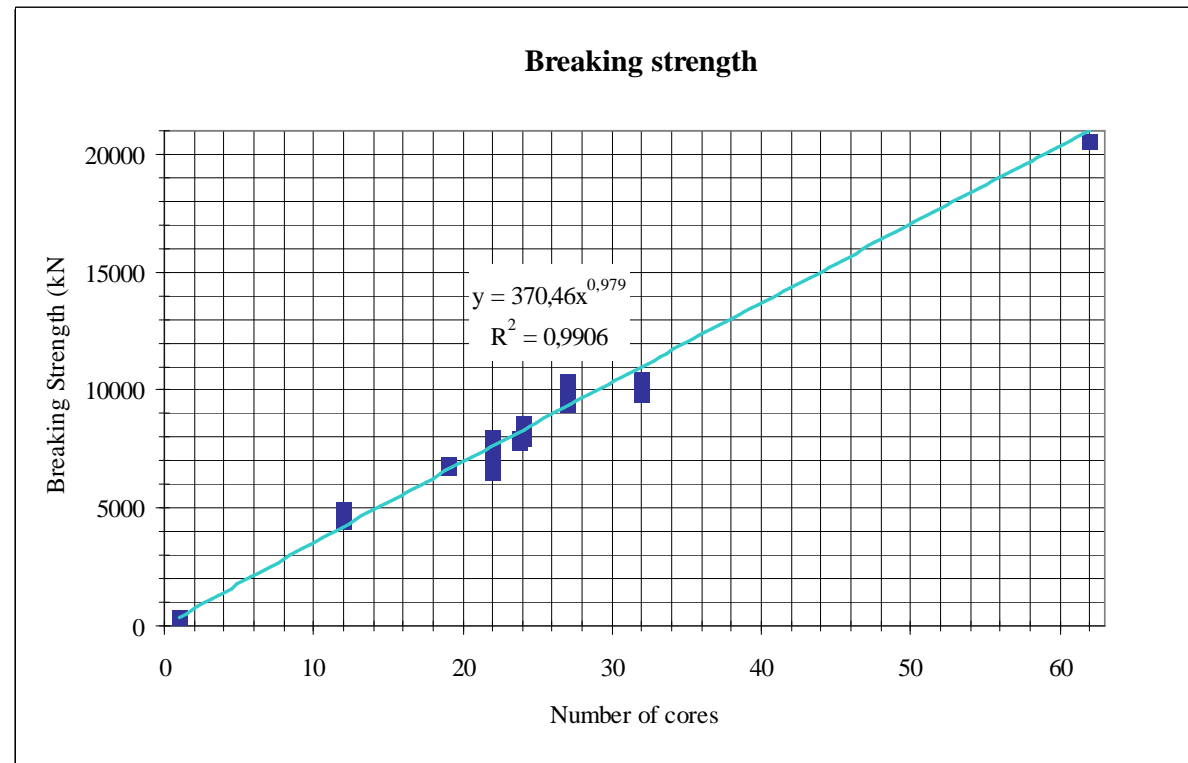
- raw material : polyester
- # subropes
- thickness of cover





Wet Breaking Strength

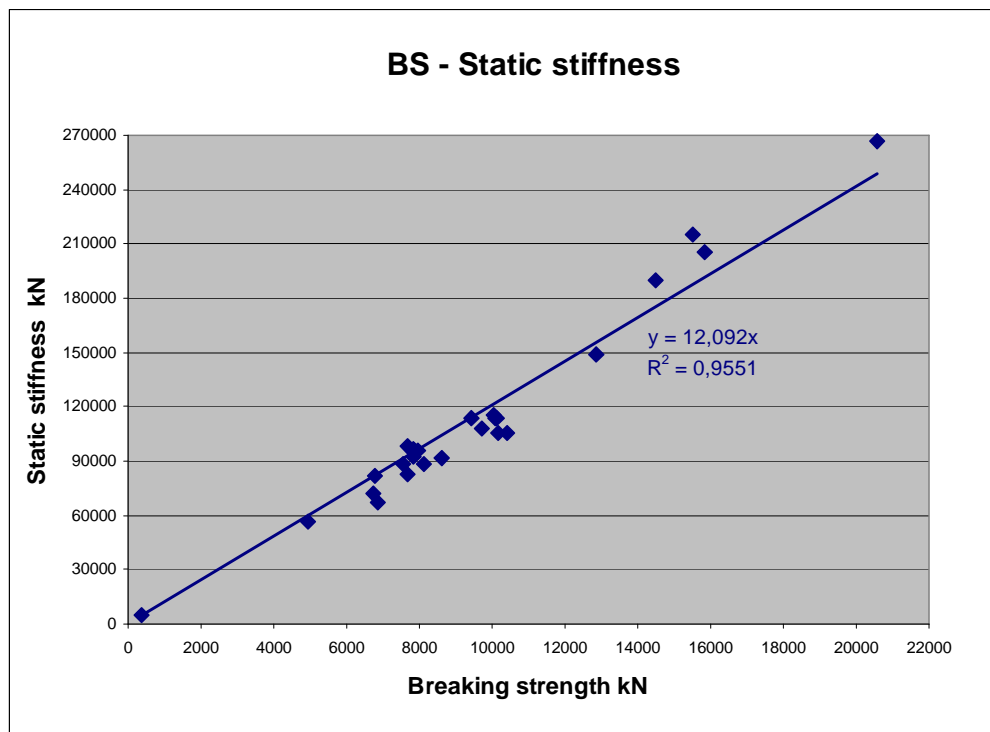
- Influencing parameters :
 - raw material : polyester
 - splicing
 - # subropes





Rope tests : Static Stiffness (modulus)

- Influencing parameters :
 - raw material : polyester
 - previous loading history (determined by certifying authority)
 - # subropes (breaking strength)



$$\text{Static Stiffness} = 12,1 \times \text{MBL}$$

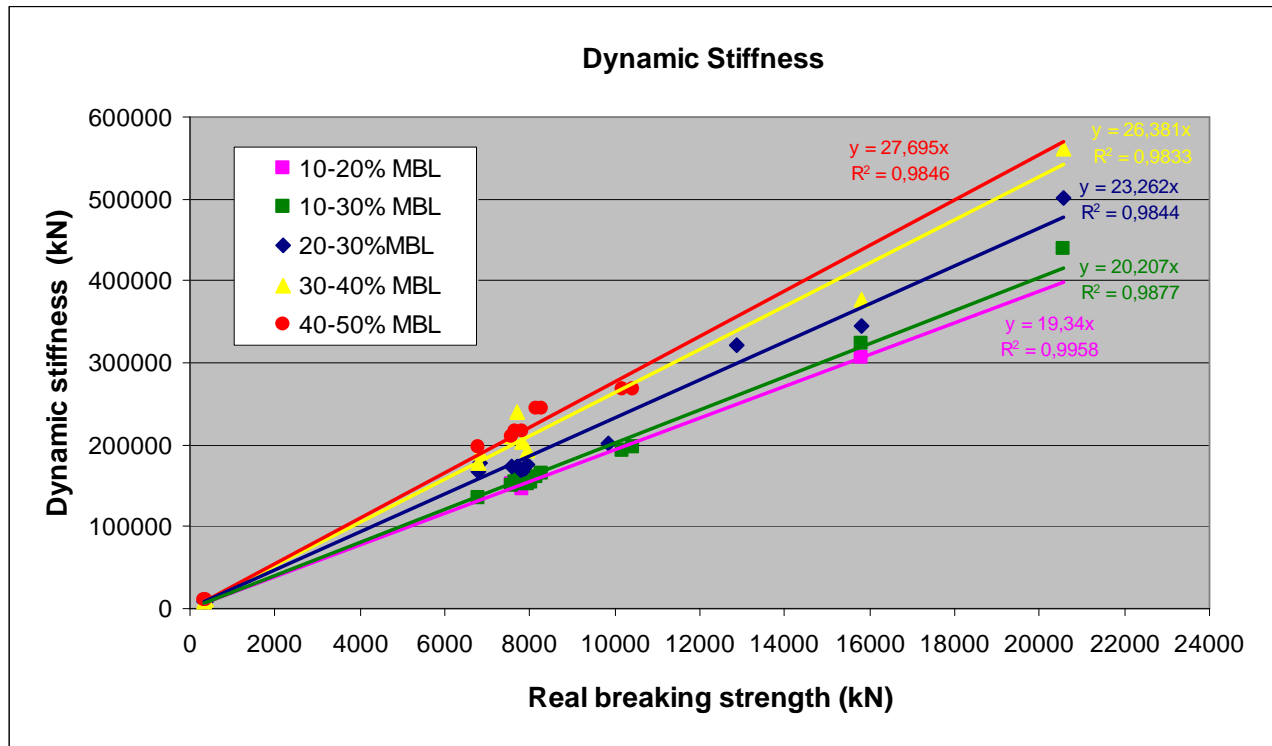


Rope tests : Dynamic Stiffness

- Influencing parameters :
 - raw material : polyester
 - previous loading history (determined by certifying authority)
 - subrope construction



Rope tests : Dynamic Stiffness



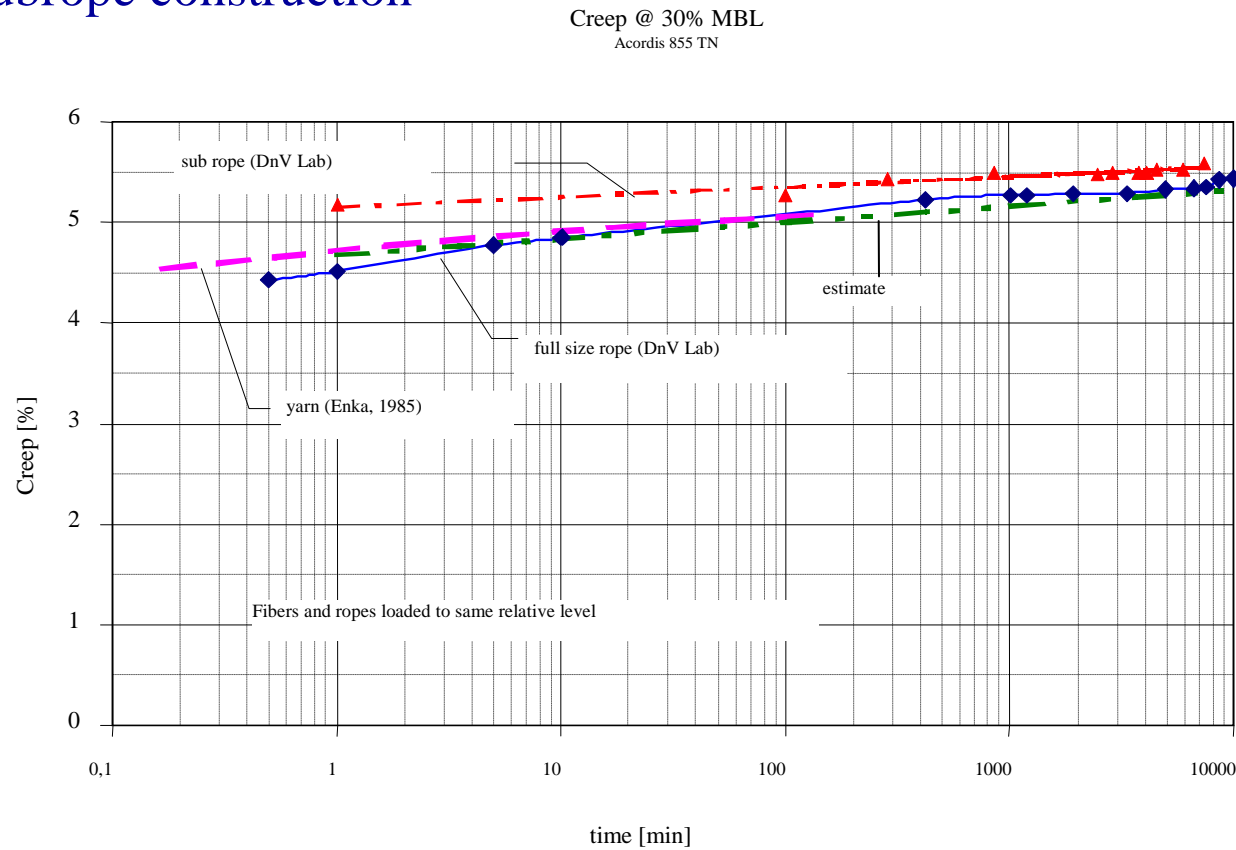
	10-20% MBL	10-30% MBL	20-30% MBL	30-40% MBL	40-50% MBL
Dynamic stiffness (x MBL)	19,3	20,2	23,3	26,4	27,7





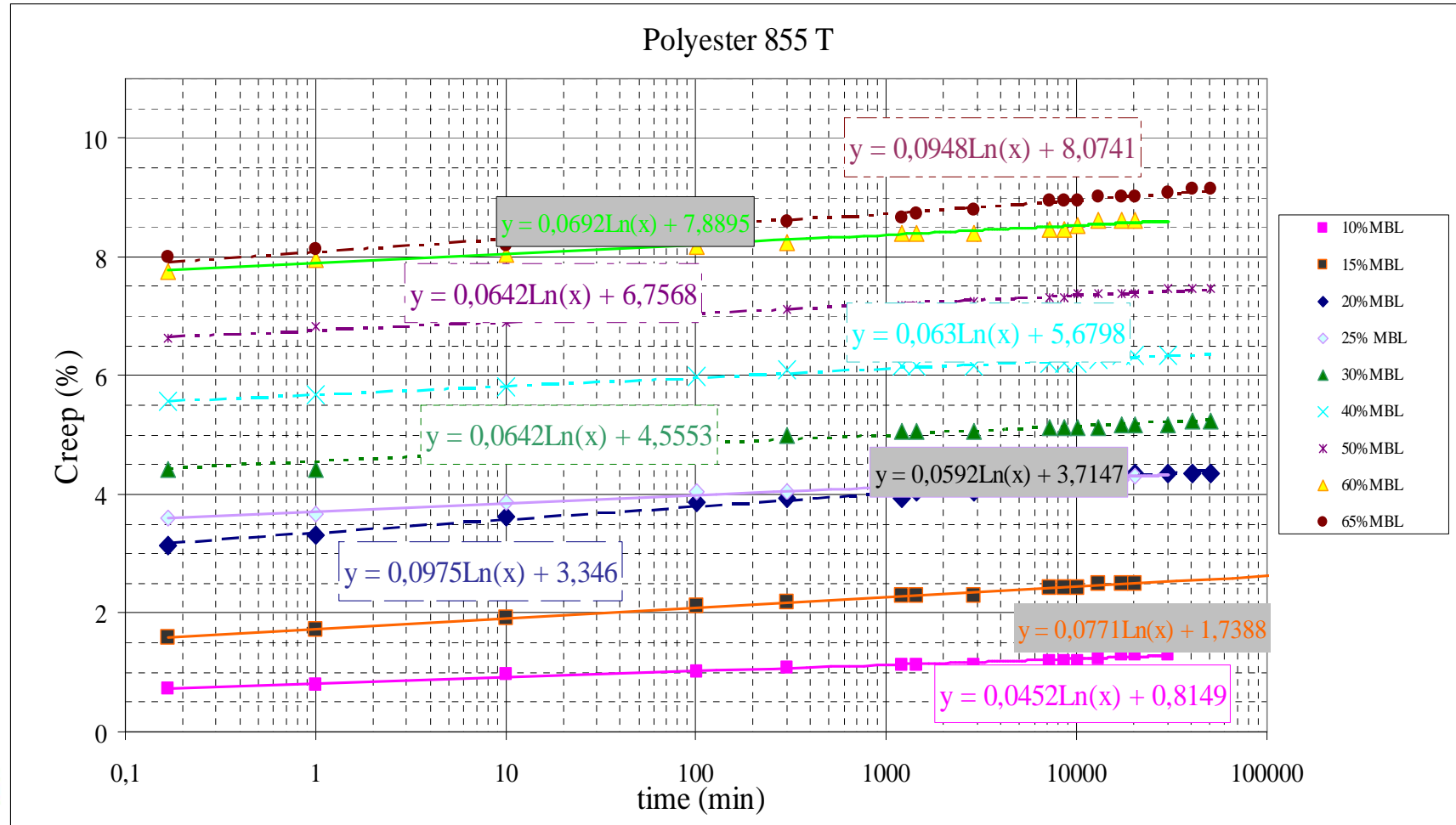
Rope tests : Creep Elongation

- Influencing parameters :
 - raw material : polyester (**supplier**)
 - subrope construction





Rope tests : Creep Elongation





Rope tests :

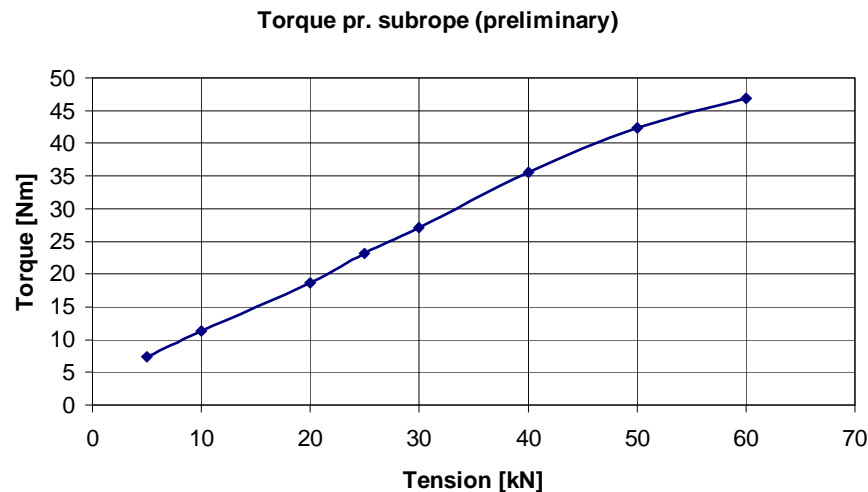
Tension-Tension Cyclic Fatigue

- Influencing parameters :
 - raw material : polyester
 - subrope construction
- Two tests were performed in 2002 for 454 tf and 750 tf rope. After 100 000 cycles between 20-40% MBL no damage was found.
- Based on the above tests ABS and DnV waived all future fatigue testing on ropes with the same basic construction, but different break strengths



Rope tests : Torsional Stiffness

- Influencing parameters :
 - raw material : polyester
 - subrope construction
- Standard rope construction is torque free
- Testing on subropes at DnV





Rope tests : Filter Performance

- Influencing parameters :
 - Filter Material
 - Number of layers of filtermaterial
- Filtertest according to Petrobras specification ET 3000.00-6651-962-PGT-001 was performed => 2 layers of filtermaterial are sufficient to achieve filter barrier up to 2 μm .





Tests performed by Bexco

- Tests have been performed on DeepRope® constructions over the range 398 tf up to 2050 tf

Test	Range		# Tests
Wet Breaking Strength	398 tf	2050 tf	47
Static Stiffness	398 tf	2050 tf	47
Wet extension	398 tf	2050 tf	47
Dynamic Stiffness	610 tf	2050 tf	47
Tension -Tension Fatigue	454 tf	750 tf	2
Bending -Tension Fatigue	800 tf	800 tf	1
Creep	454 tf	454 tf	1
Linear Density	398 tf	890 tf	8
Filter Performance	800 tf	800 tf	1



Conclusions and Questions

	Cost	Influencing parameter				
		Raw Material	Subrope Construction	# Subropes	Previous Load History	Filter
Wet Breaking Strength		X	X	X	X	
Static Stiffness		X	X		X	
Wet extension		X	X	X	X	
Dynamic Stiffness		X	X		X	
Tension -Tension Fatigue		X	X			
Bending -Tension Fatigue		X	X			
Creep		X	X			
Linear Density		X	X	X		
Filter Performance						X