canflex (USA), Inc.

"Ocean Towable Bladder"

CANFLEX "Sea Slug" vs Other Pillow Shaped Tanks

Item/Action	CANFLEX " Sea Slug" Cylindrical Shaped Tanks 	Pillow Shaped Tanks 
Towing	Canflex bladders have a hydro-dynamic torpedo shape. The cylindrical main body and matching conical ends provides greater towing capabilities.	Box / Pillow shaped tanks such as Ro-tank (Desmi) or Floating Oil Bladder U (Lamo) Box shape, or other similar models
Air Chambers	All of the air chambers on our Canflex towable bladders are integrated into the design of the tank. They are located at the bow end and on the sides and can be either air filled or foam floats.	It has an air chamber at the bow end; however, the rectangular shape will cause the entire bladder to bounce once it is towed. Sides have float fenders and no part of the bladder. If one gets lost the bladder will lose its balance on the water - similar to driving with a flat tire.
Color	Canflex bladders are International Orange or International yellow. Along with its Navigation Light, these bladders are very easy to spot or find offshore. These visibility factors allow one to safely moor the bladder until more equipment or help arrives.	Black color without navigation light. Difficult to find on an oil spill and unsafe to moor.
Connections	Canflex connections are located at top of the bladder and one at stern end. Connections are easy to access for loading, offloading and clean-up of the bladder.	With side connections, it will be under water once the bladder is towed. See their website.
Offloading	Canflex bladders, in addition to what is mentioned above, the tow end connection with straps can be used to lift the bladder to offload the remaining fluid through the stern end connection.	With no stern end connection the bag may explode or break if it is lifted while fluid filled.
Material	Canflex bladders use high quality PVC or Urethane material welded with radio-frequency. Material made and approved for oil and hydrocarbons containment Material is robust, light, and the RF welds will last for many years. If bladder is stored without use, it will last forever.	Uses very heavy rubber. If the bladder is left in storage without use, the vulcanization will last for no more than 6 years.
ISO 9001:2015	CANFLEX (USA), INC. operates a Quality Management System which complies with the requirements of ISO 9001-2015. CANFLEX (USA), INC. holds Certificate No: FM 517957	Pillow tank: None or not available.
Similarities	CANFLEX bladders can be: -Joined together for towing in water -Flat when empty, allowing it to be rolled for storage -Storage tank that can be used on land, floating in water AND TOWABLE storage. -Towed at speeds of 12 knots empty and 3-4 knots when full	Same except for speed - max speed is only 3 knots. While towing the bladder it submerges under water. It needs air inside bladder to stay afloat taking volume that could be used to store oil.

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DRAG FORCE = Fd= Cd (1/2 ρ V^2 A)

Cd Drag coeficient (1.9 for this cilindrical geometry)
ρ Density of seawater (1.99 slugs/ft3) (1030 Kg/m3)
V relative velocity between inmersed body and fluid
A projected front area

	CANFLEX "SEA SLUG" SERIES 1		**OTHER FLAT END- PINTCH END from Competitor	
MODEL	FCB-5CM	FCB-10CM	5 m3	10 m3
VOLUME (US GALS)	1,320	2,640	1,320	2,640
VOLUME (Liters)	5,000	10,000	5,000	10,000
VOLUME (m3)	5.0	10.0	5.0	10.0
DIAMETER (INCHES)	42.00	50.40	60.00	72.00
*PROJECTED FRONT (50%) AREA in^2	692.72	997.52	2,827.43	4,071.50
PROJECTED FRONT AREA FT^2	4.81	6.93	19.63	28.27
PROJECTED FRONT AREA m^2	0.45	0.64	1.82	2.63

Drag Force= Fd=Cd (1/2 ρ V^3 A)	FCB-5CM	FCB-10CM	5 m3	10 m3
DRAG FORCE in N @ 2 KNOTS	454.98	655.16	1,857.04	2,674.14
DRAG FORCE in N @ 4 KNOTS	1,819.90	2,620.66	7,428.17	10,696.57
DRAG FORCE in N @ 6 KNOTS	4,094.78	5,896.48	16,713.38	24,067.27

MODEL	FCB-5CM	FCB-10CM	5 m3	10 m3
Min. MOTOR HP @ 2 KNOTS	0.62	0.90	2.54	3.66
Min. MOTOR HP @ 4 KNOTS	4.98	7.17	20.31	29.25
Min. MOTOR HP @ 6 KNOTS	16.80	24.19	68.56	98.72

Inputs: Terminal speed KNOTS
2
4
6

SPEED - KNOTS	FCB-5CM- FORCES (N)	FCB-10CM- FORCES (N)		SPEED - KNOTS	5 m3- FORCES (N)	10 m3- FORCES (N)	
2	454.98	655.16	PASS	2	1,857.04	2,674.14	PASS
4	1,819.90	2,620.66	PASS	4	7,428.17	10,696.57	FAIL
6	4,094.78	5,896.48	PASS	6	16,713.38	24,067.27	FAIL
CANFLEX - 5:1 SF	52,919.00	52,919.00		Competitor - 5:1 SF	N/A	N/A	

CONCLUSIONS

1) CANFLEX Bladder can be towed without any problems up to 6 Knots or higher because the Bow towing briddle is built at a 5:1 Safety Factor (SF)

2) The tow briddle fails at a force applied of 10,584 N, therefore the competitors bladders will FAIL at speeds of 4 and 5 knots respectively

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**OTHER FLAT END- PINTCH END from Competitor		
5 m3	10 m3	
1,320	2,640	
5,000	10,000	
5.0	10.0	
60.00	72.00	***
2,827.43	4,071.50	
19.63	28.27	
1.82	2.63	

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1,857.04	2,674.14
7,428.17	10,696.57
16,713.38	24,067.27

Tonne = 1000 Kg ----- Newtons / gravity (9.8m2/s)/1000Kg	FCB-5CM	FCB-10CM
Min. Bollard pull required in TONNE @ 2 KNOTS	0.05	0.07
Min. Bollard pull required in TONNE @ 4 KNOTS	0.19	0.27
Min. Bollard pull required in TONNE @ 6 KNOTS	0.42	0.60

5 m3	10 m3
0.19	0.27
0.76	1.09
1.71	2.46

Power= Fd.v=Cd (1/2 ρ V^3 A)	FCB-5CM	FCB-10CM
Min. MOTOR WATT@ 2 KNOTS	464.07	668.27
Min. MOTOR WATT@ 4 KNOTS	3,712.60	5,346.14
Min. MOTOR WATT@ 6 KNOTS	12,530.02	18,043.23

5 m3	10 m3
1,894.18	2,727.62
15,153.47	21,820.99
51,142.95	73,645.85

MODEL	FCB-5CM	FCB-10CM
Min. MOTOR HP @ 2 KNOTS	0.62	0.90
Min. MOTOR HP @ 4 KNOTS	4.98	7.17
Min. MOTOR HP @ 6 KNOTS	16.80	24.19

5 m3	10 m3
2.54	3.66
20.31	29.25
68.56	98.72

Inputs: Terminal speed KNOTS
2
4
6

***The Projected Area is 50% (or less when at lower speeds) under water. The cylindrical main body, cone ends and upright tow end improves towing performance**
The bladder's tow end has a internal air flotation bladder that keeps the end above water

** Competirors Flat end withous internal floatation bladder
*** Dimentions from competirors specs

CONCLUSIONS:
Competitors Drag forces are almost 4 times higher than Canflex bladders.
Comnpetitors end will fail at low and higher speeds as was found in Panama Canal