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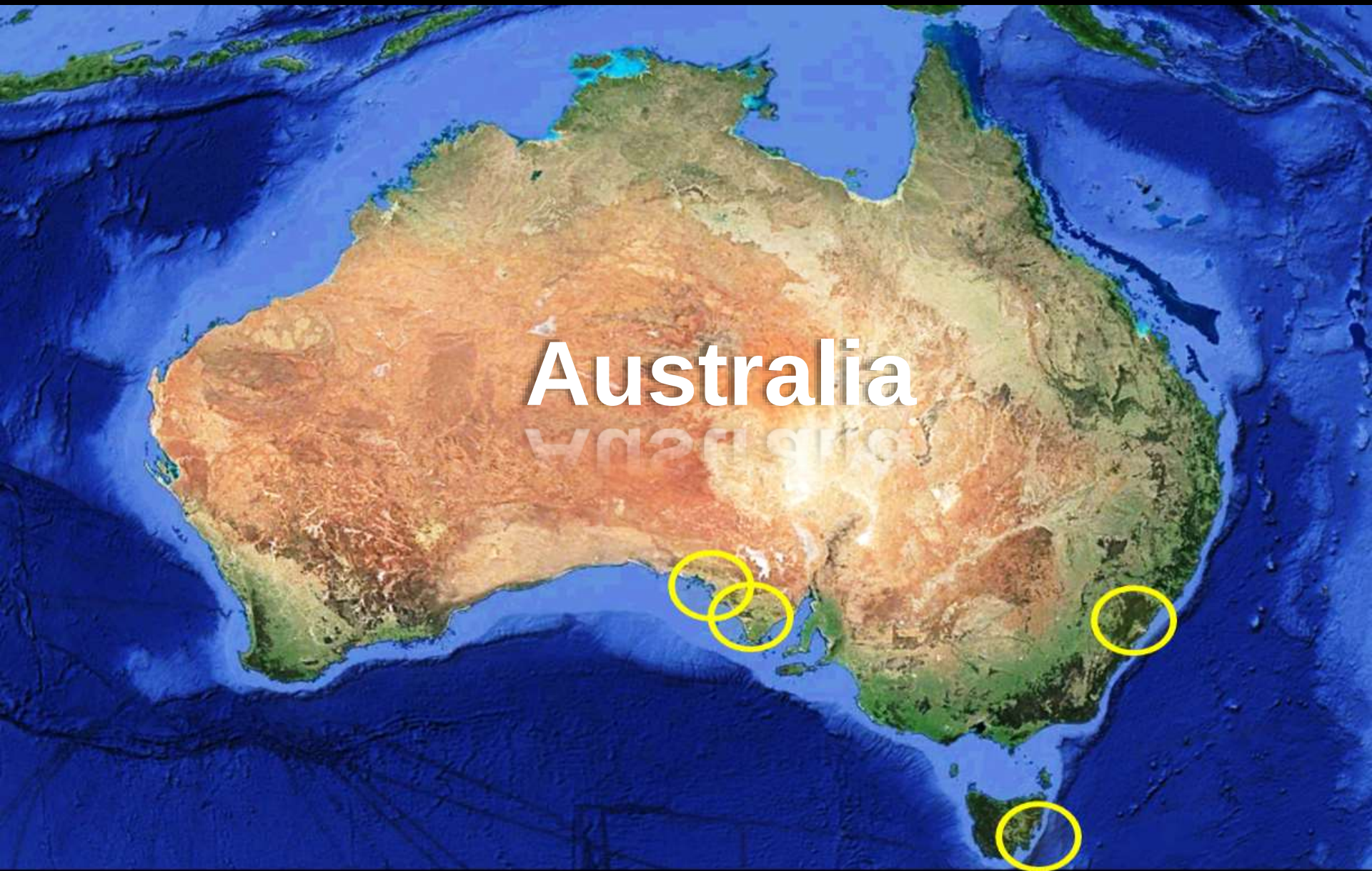
Long Line Oyster Farming Systems

Ceduna, South Australia

Edible oyster production regions



Evidence from ancient shell middens indicate that indigenous Australian aboriginals collected oysters

The first European convicts, soldiers and settlers harvested native oysters from rock, natural oyster reefs, mangroves and mud flats as early as…

1778

Harvest and collection of native shellfish species began in1848 in Coffin Bay South Australia and was the States first licenced fishery.

Wild harvest of native Angasi oysters in Coffin Bay continued for nearly a century before overfishing caused the fishery to collapse in 1945.

Coffin Bay oyster fishers practiced dredging in deep water and used rakes and tongs in shallow water.

Oyster farming commenced in NSW circa 1866. Rocks were set out in rows along the shoreline and mud flats of coastal rivers, estuaries and bays along the east coast of Australia to farm rock oysters.

Oyster farming as a licenced fishery started with the first licence being granted to a Mr. Thomas Holt at Gwawley Bay, Georges River, NSW in 1872

Early Sydney Rock oyster farmers pioneered the Australian oyster industry.. by adapting various rock and timber culture methods.

Black Mangrove sticks used by farmers were plentiful and easy to handle, becoming the preferred farming method well into the 1970's until stands of straight mangroves virtually disappeared.

The over exploitation of mangroves harvested for oyster sticks gave way to milled hardwood sticks which quickly became the mainstay of the NSW Sydney Rock oyster industry.

Stick culture farming of Pacific oysters also proved very successful in New Zealand but proved unsuccessful in Tasmania and was untried in South Australia.

Many of the successful oyster cultivation methods developed throughout Asia and Europe were not adopted due to high labour cost or quality deficits.

Tray culture methods are used successfully for growing single oysters in the calm and protected bays and estuaries of NSW and New Zealand.

Trays were not ideal for use in the many of the exposed coastal regions of SA and Tasmania.

Environmental conditions in South Australia and Tasmania did not allow sufficient collection of commercially viable numbers of wild caught spat to successfully farm with either stick, bag or tray culture methods.

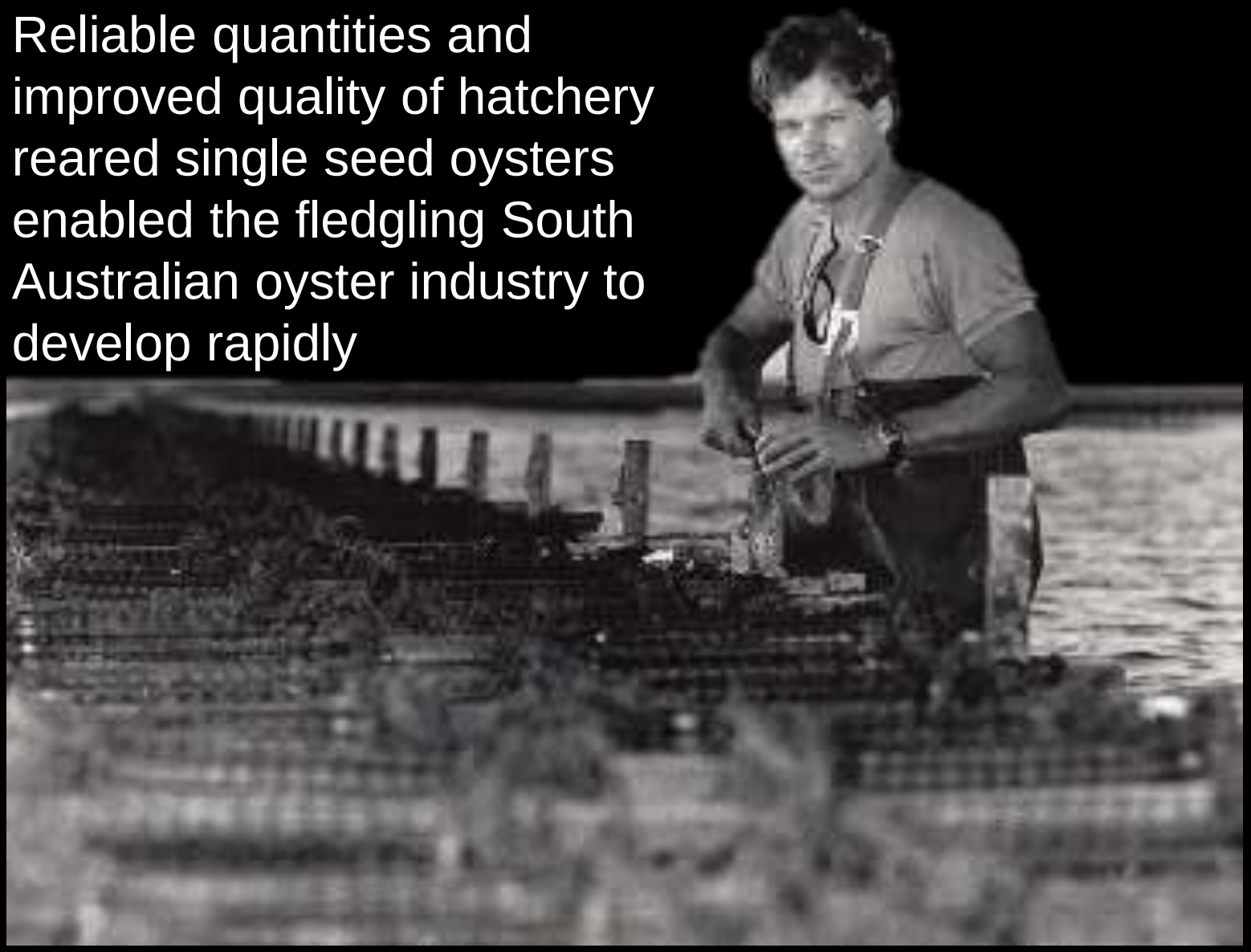
In the 1980's single seed hatchery technology developed by Shellfish Culture Ltd. and Cameron's of Tasmania pioneered the modern era of single seed oyster farming in Australia.

Benefits to industry of single seed oyster production (Crassostrea gigas)

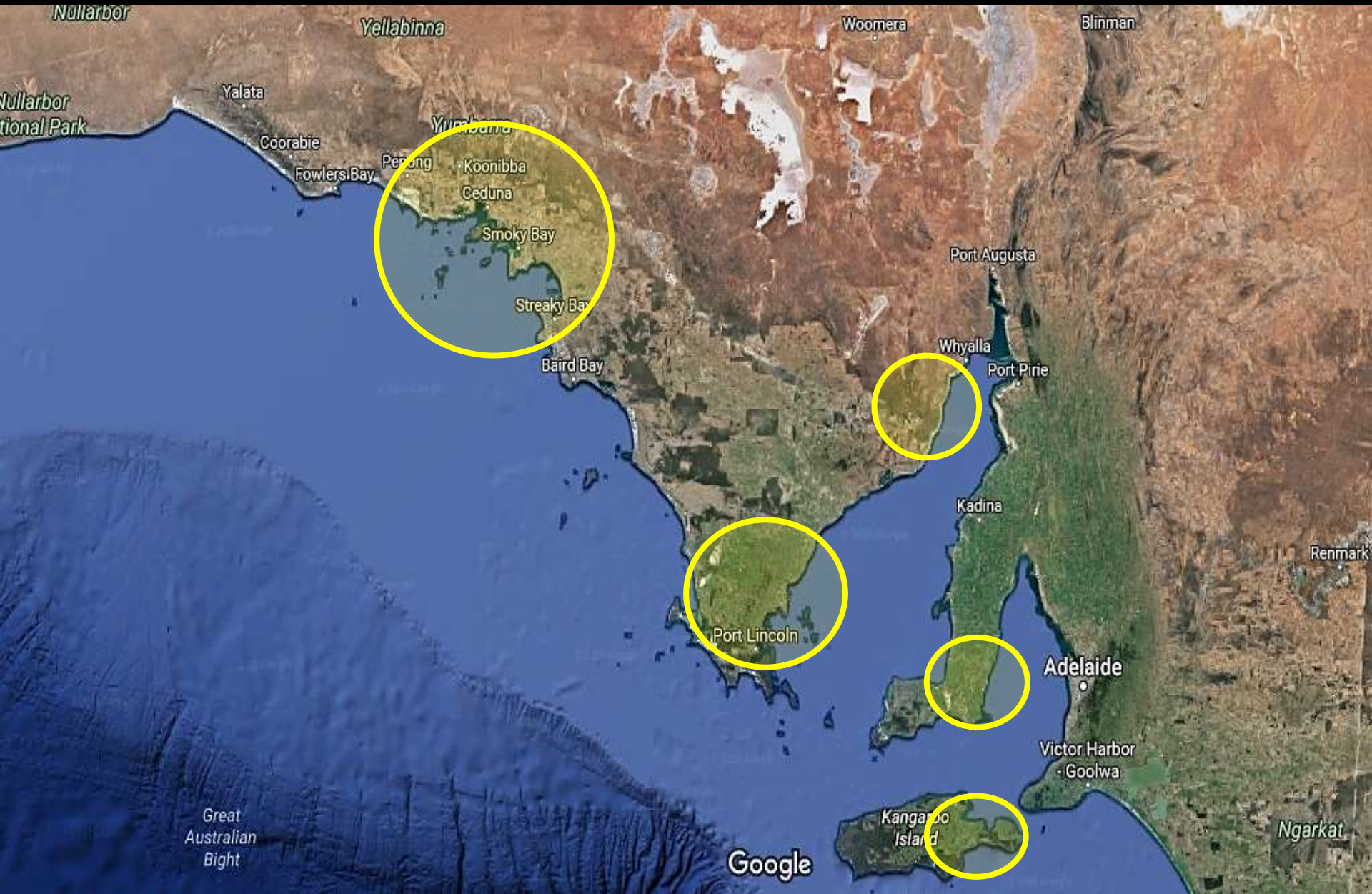
- Triploid production (spawnless oysters)
- Selection for shell shape and meat quality
- Improved growth rates
- Survivability traits
- Consistent supply
- Selection for disease and virus resistance
- Ideally suited for mechanical grading and electronic sorting equipment
- Elimination of manual splitting and culling
- Higher recovery rates
- Improved returns via higher value product

Early 1990's.

Reliable quantities and improved quality of hatchery reared single seed oysters enabled the fledgling South Australian oyster industry to develop rapidly



South Australia



Pacific Oyster (Crassostrea gigas) farming regions of South Australia

- The key oyster producing regions in South Australia .. on the eastern, southern and western coastline of Eyre Peninsula. Oyster production also occurs on a lesser scale on Yorke Peninsula and the north coast of Kangaroo Island.
- The oyster farming coastline .. mainly shallow protected bays, stretches of exposed sandy beaches and rugged coastal cliffs.
- Tide ranges varies 0.0 -1.8 metre during summer months and.. 0.5 – 2.5 metres in winter.
- South Easterly winds generated by high pressure systems moving easterly across in the Great Australian Bight during the summer months drives nutrient rich cold water upwelling's into the oyster growing bays.
- Most of the substrate in the bays consist of a mixture of both firm sand bars and soft sand with vast seagrass meadows.

South Australia

South Australia

ES Table 1 Aquaculture production and value of production, South Australia, 2012/13 and 2013/14

	Weight ('000kg)			Value ($m)		
	2012/13	2013/14	Change	2012/13	2013/14	Change
Southern Bluefin Tuna	7,486	7,544	1%	153.50	122.40	-20%
Marine Finfish	889	579	-35%	11.26	8.01	-29%
Oysters						
adult [a]	5,710	4,900	-14%	35.00	32.08	-8%
on-grown [b]	3,720	1,423	-62%	7.19	2.34	-67%
spat [c]	-	-	-	0.30	0.23	-24%
Mussels	1,480	1,619	9%	2.94	3.45	17%
Abalone	236	330	40%	8.60	10.89	27%
Freshwater Finfish	311	233	-25%	5.39	2.37	-56%
Marron and Yabbies	11	12	10%	0.38	0.43	13%
Other [d]	3,407	230	-93%	25.67	1.74	-93%
Total [e]	**19,531**	**15,447**	**-21%**	**243.04**	**181.59**	**-25%**
Tourism (visitors '000)	9	8	-11%	0.51	0.51	0%

[a] The weight for adult Oysters is an approximation on the basis that a dozen Oysters weighs one kilogram.

[b] The volume and value of juvenile Oysters sold for on-growing are excluded from the total volume and value of aquaculture as it is considered an input to production for the final sales of adult Oysters.

Threats to single seed production

What is POMS?

- POMS is a disease that only affects Pacific Oysters (Crassostrea gigas) and is caused by a virus called OsHV-1 micro variant. This virus has not affected other oyster species, such as the Sydney Rock Oyster.
- The highest mortalities occur in juvenile oysters (between 60%-100%), however all life stages have been recorded as susceptible.
- Hatcheries located in regions where POMS persists cannot supply spat to regions free of the virus which impacts heavily on spat supply.
- Breeding and cultivating OsHV-1 resistant Pacific oysters will reduce the commercial impact of a viral outbreak.
- SAMS (South Australian Mortality Syndrome) was also a major cause of loss of production in South Australia over the past 5-6 years.
- The cause of SAMS is still undetermined but environmental changes are suspected.

South Australia

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ES Table 5 Projected growth in South Australian aquaculture value of production, 2014/15 to 2016/17 [a]

	Actual GVP ($m)	Low GVP Forecast ($m) [b]			High GVP Forecast ($m) [c]		
	2013/14	2014/15	2015/16	2016/17	2014/15	2015/16	2016/17
Southern Bluefin Tuna	122.4	136.3	147.6	149.3	136.3	147.6	149.3
Marine Finfish	8.0	14.0	14.0	14.0	16.0	16.0	16.0
Oysters	32.3	33.9	34.0	34.1	34.1	34.3	34.4
Mussels	3.4	3.7	3.8	3.8	3.8	3.9	3.9
Abalone	10.9	12.4	12.7	13.2	12.4	12.7	13.2
Freshwater Finfish	2.4	2.6	2.5	2.5	2.6	2.5	2.5
Marron and Yabbies	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Other	1.7	1.9	1.7	1.7	1.9	1.7	1.7
Total [d]	181.6	205.2	217.0	219.2	207.5	219.3	221.5
Tourism	0.5	0.6	0.6	0.6	0.6	0.6	0.6

[a] All estimates of gross value of production (GVP) are in 2015 dollars.

Shellfish quality assurance programs

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- Government and Industry funded State based programs monitor water and shellfish quality.
- Critical for maintaining food safety standards
- Certified harvesting areas
- National body regulators - Australian Shellfish Quality Assurance Program (ASQAP)
- Export Standards compliance (Export Control Act 1982)

NSW FISHERIES

NEW SOUTH WALES SHELLFISH QUALITY ASSURANCE PROGRAM

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Tasmanian Government

Accredited Bivalve Mollusc Producer SASQAP South Australia

Evolution…
Adjustable longline farming method

Oyster farming is infrastructure intensive

Without raised or suspended infrastructure oysters are only able to be collected from the seabed

Fixed wooden rack and stick basket culture dominated the development of the South Australian and Tasmanian oyster industries until the late 1990's

Richie Baker, Tony Schutz and Geoff Turner (BST) pioneered the development of the adjustable longline intertidal oyster farming method in Cowell South Australia during the early 1990's

Original handmade soft mesh baskets

Standard orientation of baskets along the line

Geoff Turner

Adjustable longline farming method benefits

- The innovation of being able to quickly and efficiently adjust line heights out on an intertidal oyster farm enables growers the ability to control and fine tune oyster shell growth, shell hygiene and meat condition by adjusting the growing height of oysters vertically in the water column.
- No longer do farmers need to select an average height that is too high in summer or too low in winter or the need to physically transfer oysters from one fixed height to another to manage the characteristics of their oysters.
- This adjustable longline farming technology is ideally suited for rearing single seed oysters destined for the high end retail and restaurant trade.

Why raise growing heights?

- Raising the height of the line exposes farmed shellfish to higher levels of wind generated wave energy. Shell pruning from this exposure results in thick, clean, hard cupped shaped shells ideally suited for high value whole live and half shell markets.
- Increased exposure time out of the water assists in developing a strong adductor muscle which is important for enabling whole live oysters to travel well from farm to distant markets.
- Shell pruning through the action of oysters rumbling against each other within the basket improves the hygiene of the outer shell. Clean shell assists in the prevention of marine predators and parasites such as flatworm and mudworm entering the shell to kill or lower the value of the oyster.

Clean, hard shelled, deep cupped oysters

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Why lower growing heights?

- Mature oysters will benefit from being lowered in the water column increasing feeding time to promote meat condition.
- Multiple growing heights enable farmers to place oysters in the ideal tidal range year round regardless of seasonal tides to optimise the varying tasks necessary to balance both shell growth and oyster fattening.
- The open nature of the adjustable longline system allows exposed farming locations traditionally considered too rough for conventional wooden rack and rail technologies to be used.
- Lowering of the lines increases the feeding time of juvenile oysters which is important for promoting shell growth and reduces the impacts of shell pruning in exposed sites.

Clean, deep cupped, full conditioned

Ideally suited to electronic grading

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Typical quad (4) line set up

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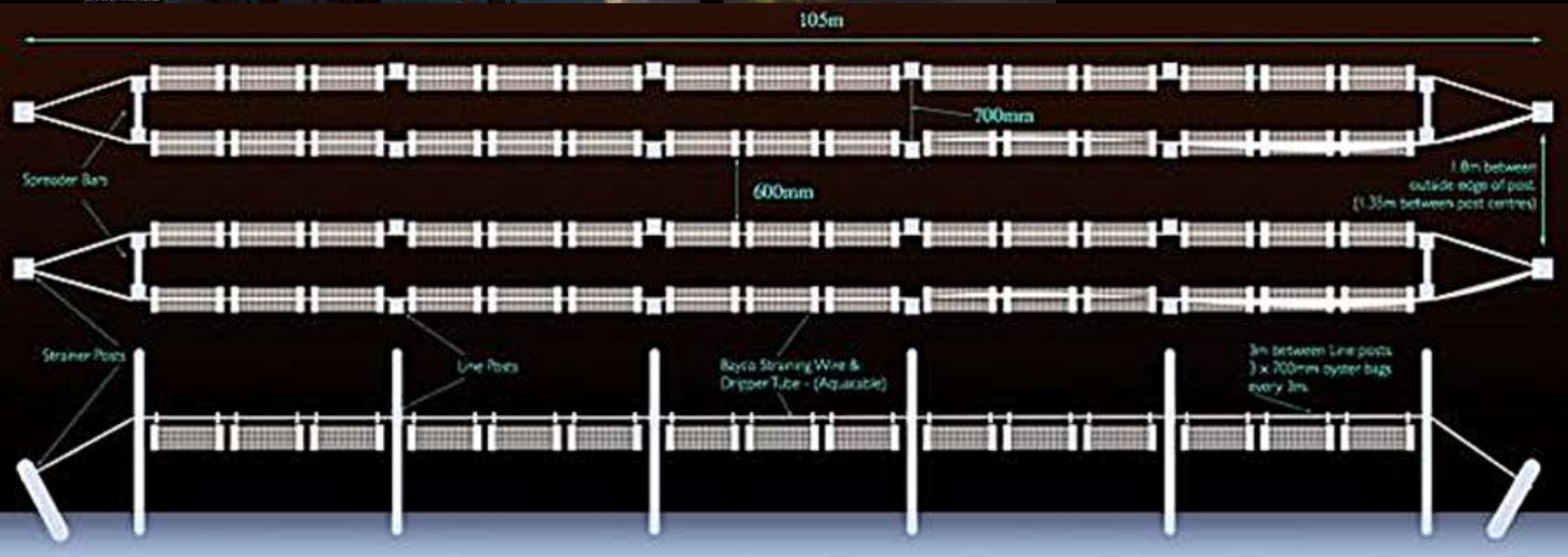

Handmade baskets began evolving with the introduction of injection moulded components by BST

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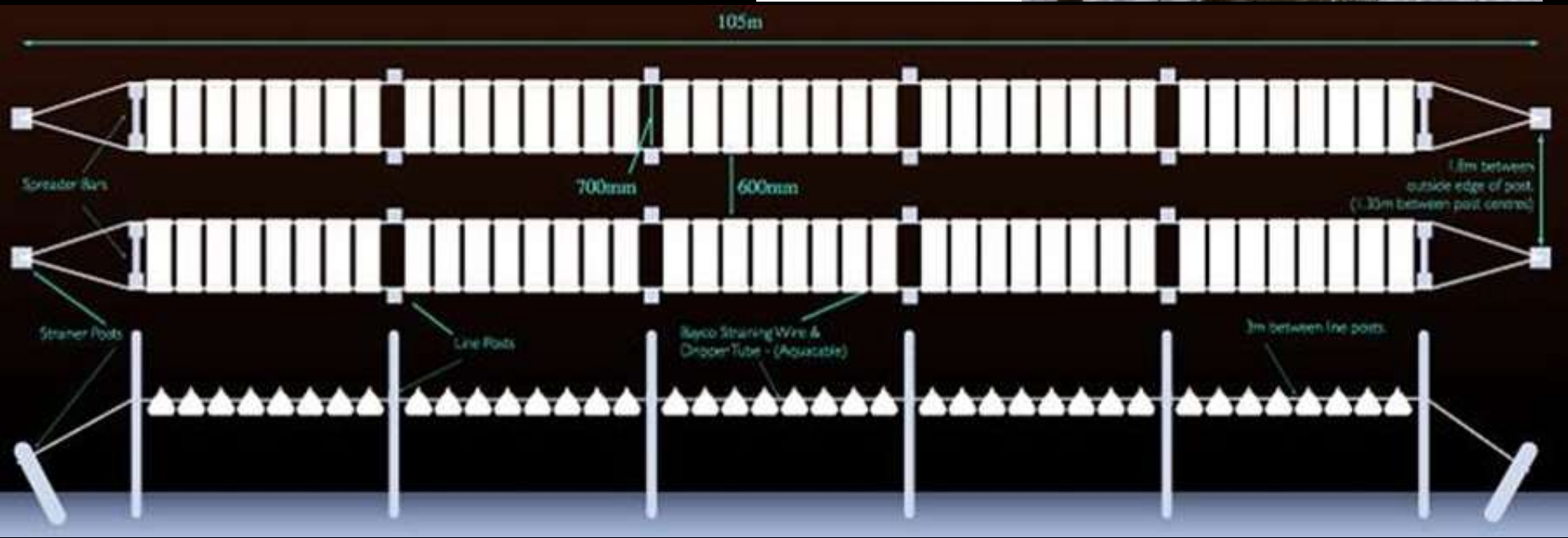

The evolution of the adjustable longline system continued with other companies designing and manufacturing the first fully injection moulded baskets specifically for adjustable longline.

WHY HEXCYL?

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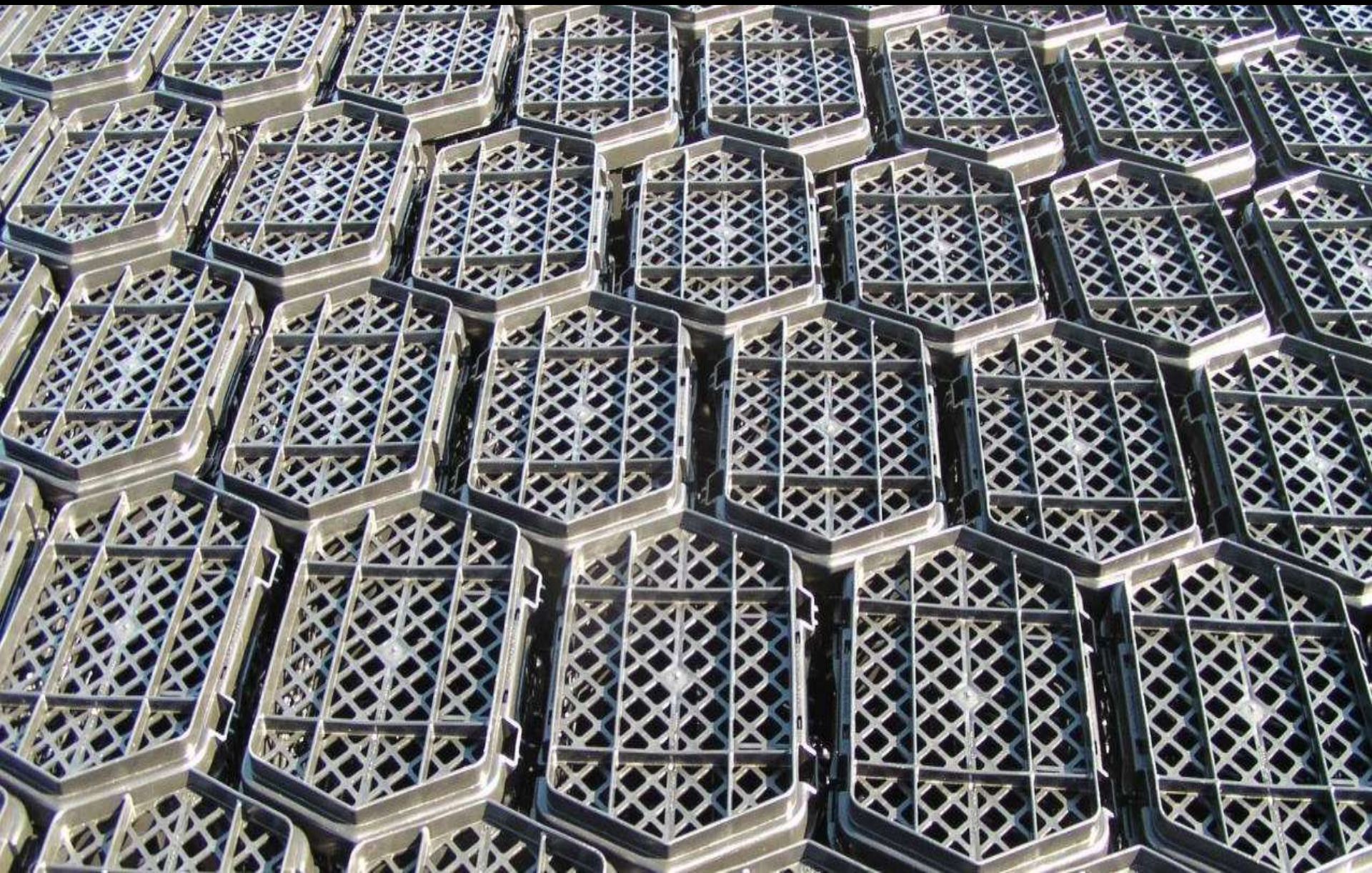

Because……..

Redundant Technology = Inefficiency & Waste

Because……

Poor Design = High Maintenance

Because……

Poor Design= High Replacement Cost

Because…evolution drives change

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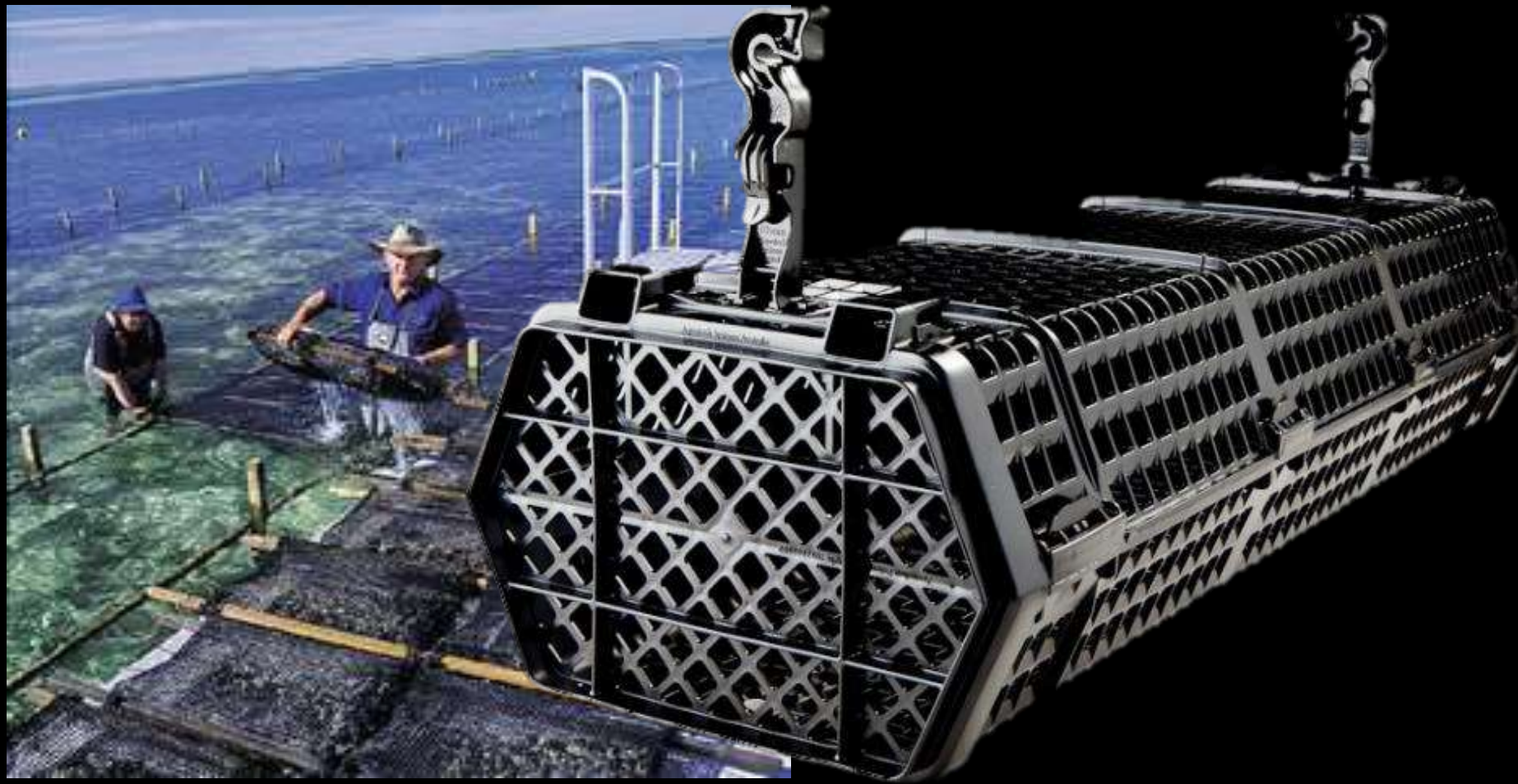

Hexcyl baskets firm, flat surface assists shell pruning for producing clean hard shell.

Hexcyl's patented pivot bank eliminates unnecessary wear at the connection of the suspension clip and the basket body

Hexcyl baskets are extremely robust and very efficient for stacking and handling

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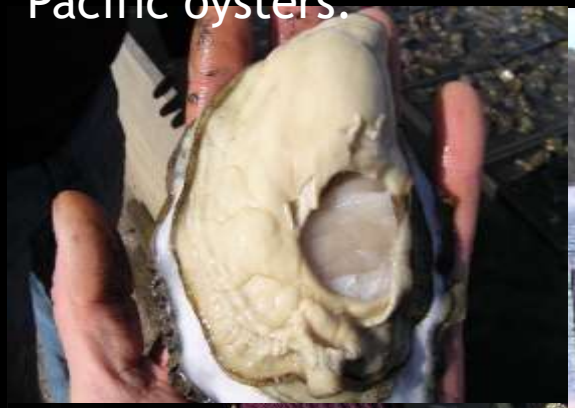
Hexcyl HD-1521 (30 litre) basket provides plenty of room for growing and conditioning even the largest sizes of oysters

Triploid single seed Pacific oysters.



Porto Bay, Hawkesbury River. June 2009

25 litre Hex-Pro Shellfish Basket Range.

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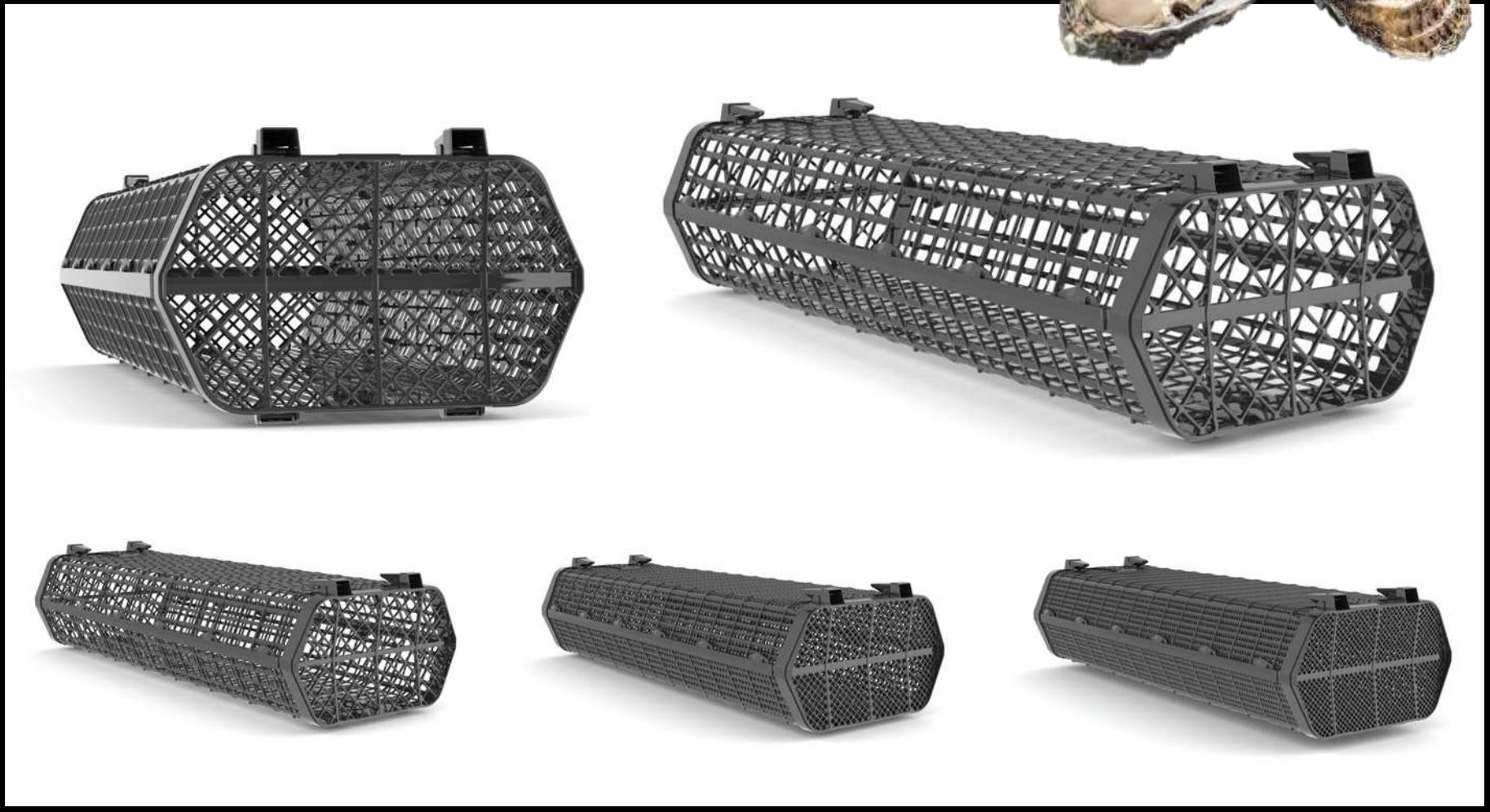
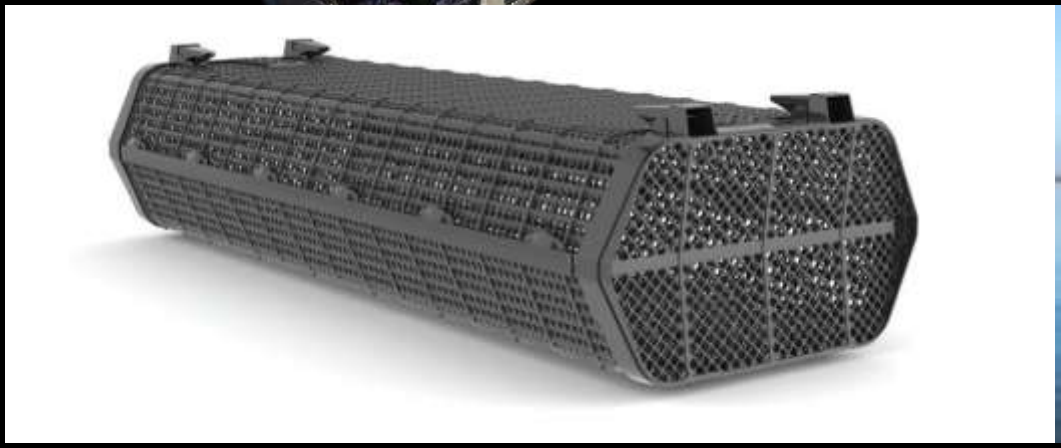
Efficient Design, Superior Material Selection = Versatility and Longevity.



Small mesh sizes of 3mm and 5mm are ideally suited for 4000+ screen size single seed spat.

25 litre
Protection from crab predation basket

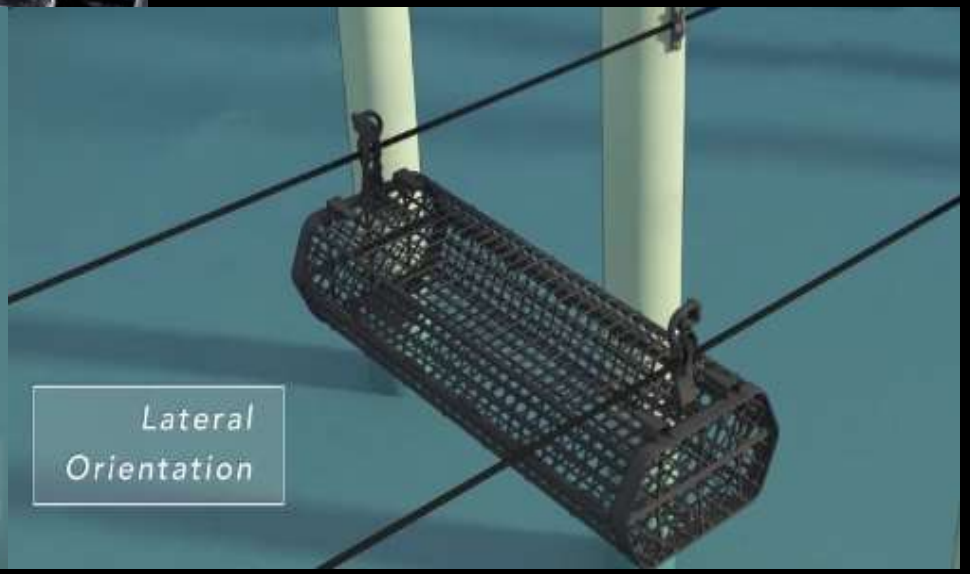


Hexcyl baskets can be adapted to house many different species.

Adjusting Hexcyl longlines

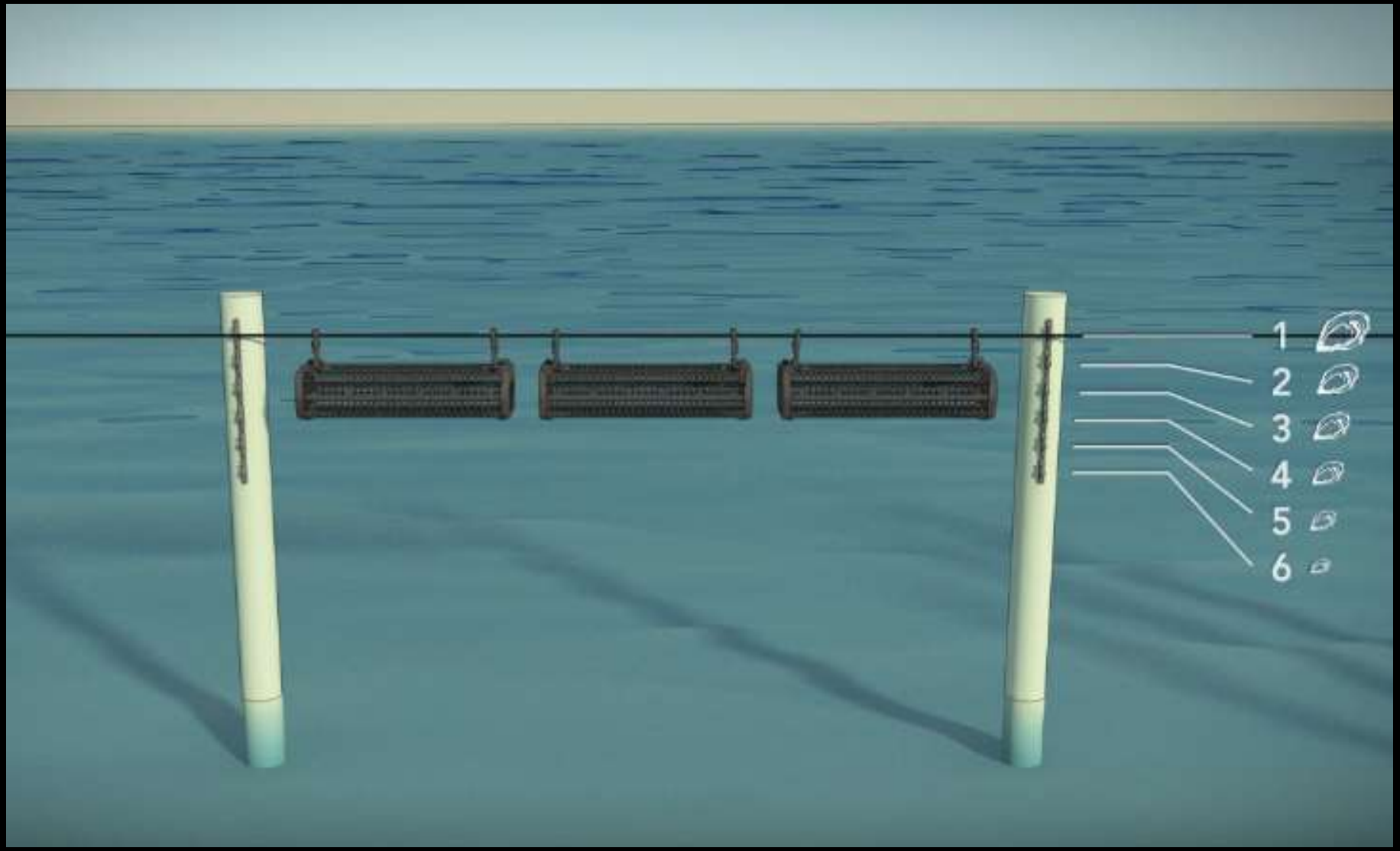
Hex Pro SC-10 enables the shellfish basket to be connected along and across a set of two lines.

J-hook locked in upright operating position.
No movement = no wear.



Typical seasonal growing heights for Winter/Autumn and Spring/Summer

Managing growth and growing heights for juvenile, intermediate and mature oysters.



Overview of adjustable longlines

End anchor post

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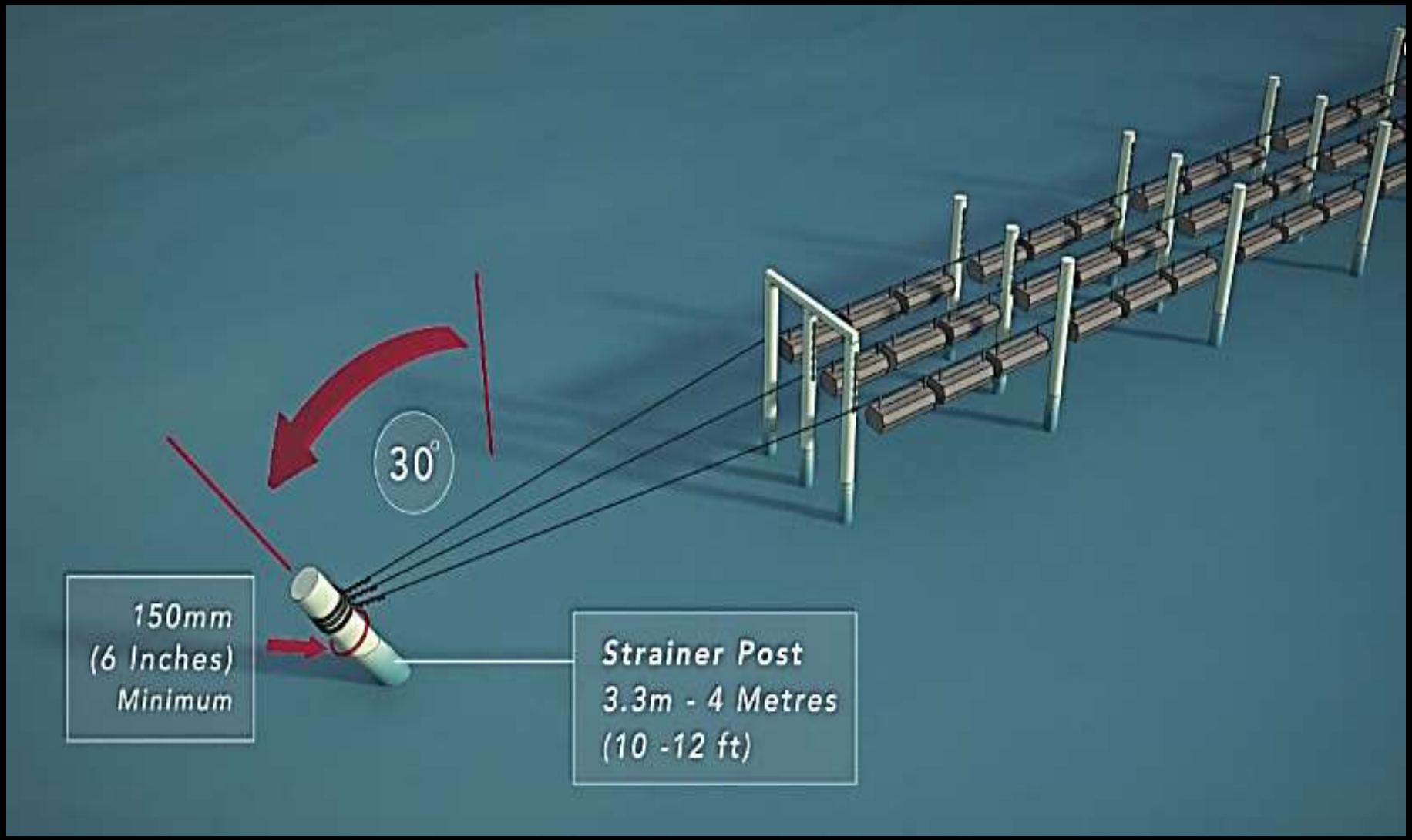

Triple line (3) Plan view

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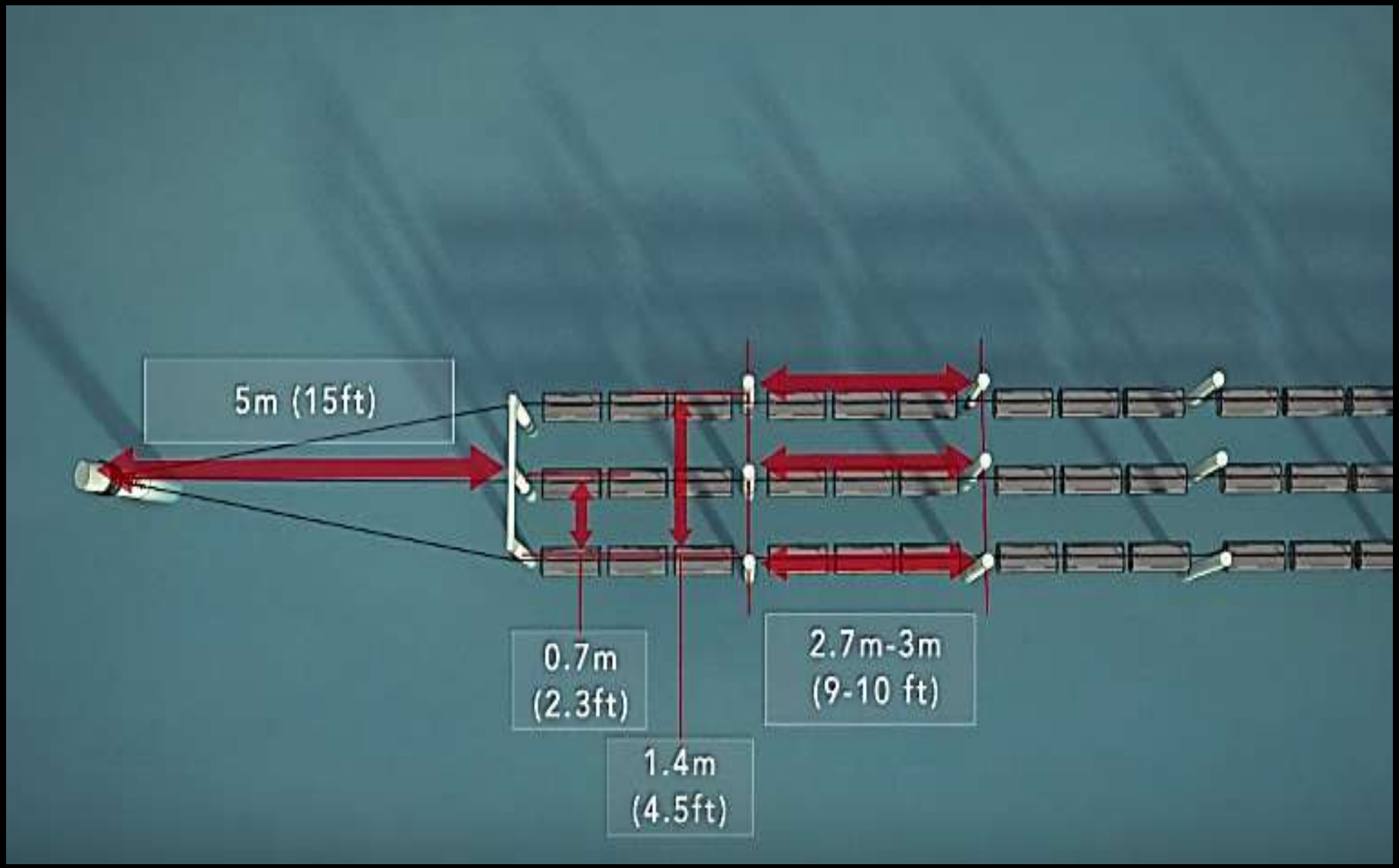
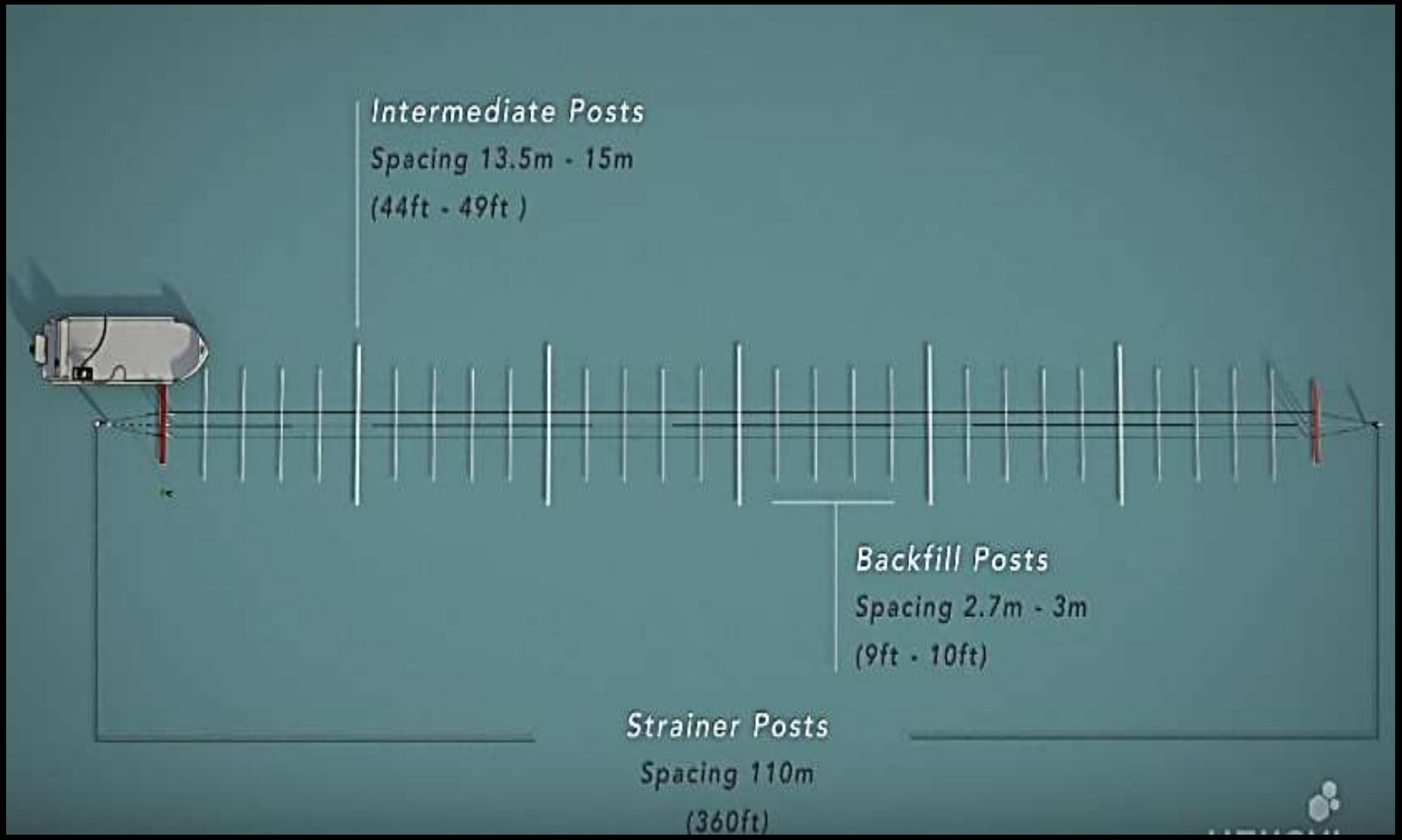
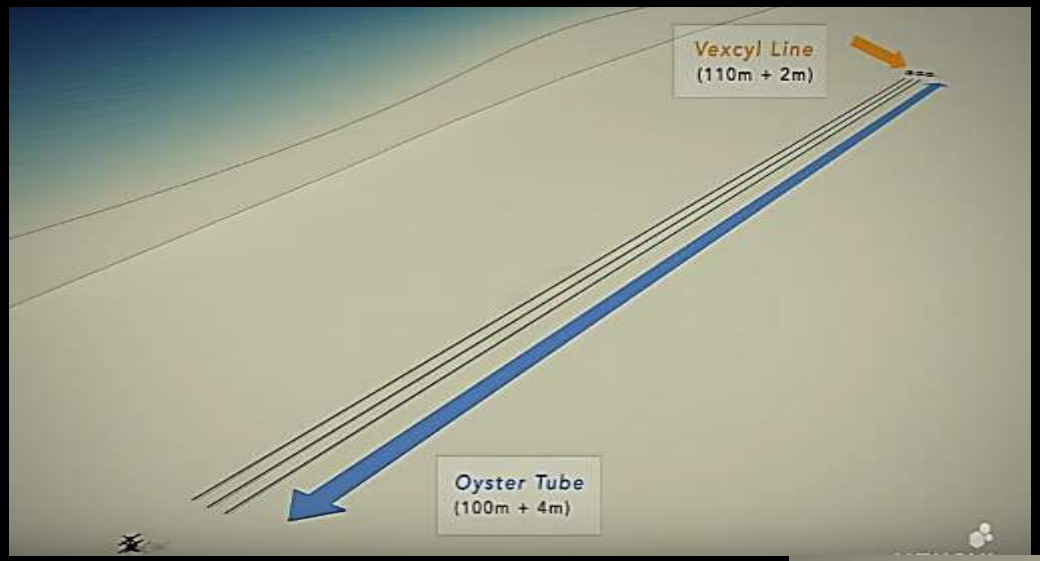


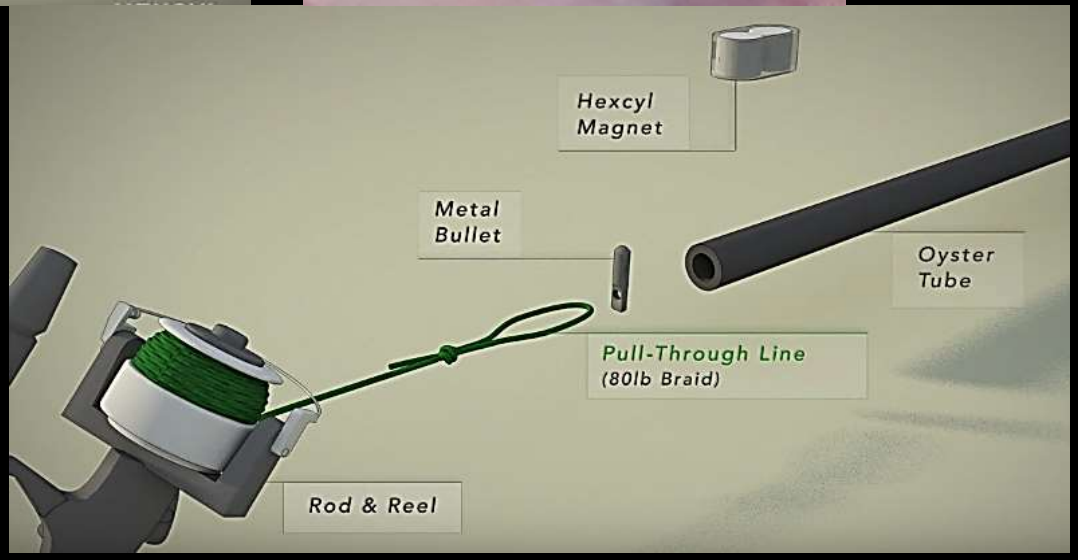
Typical post spacing distances



Thread Vexcyl line and HDPE tube

Cut tube to length





Attach metal bullet

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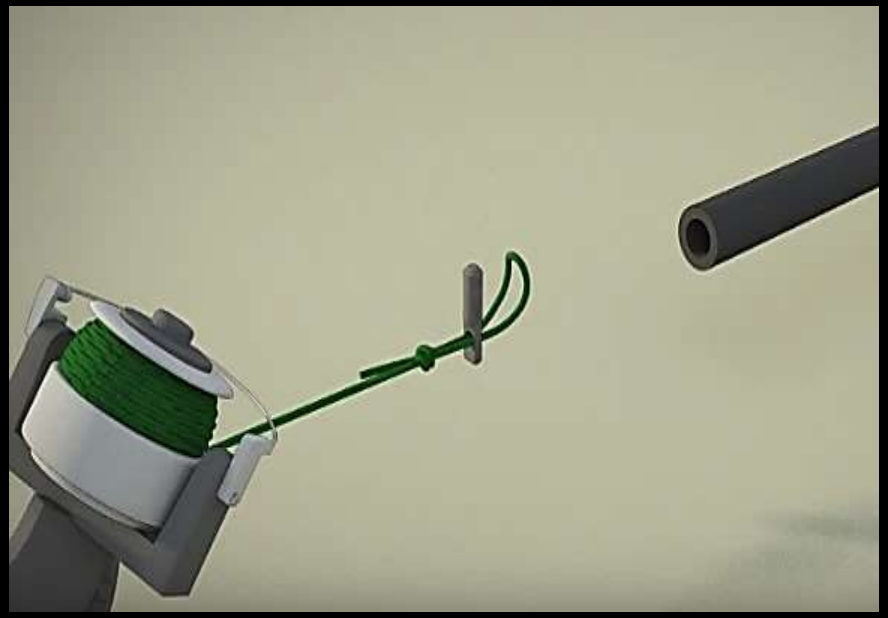

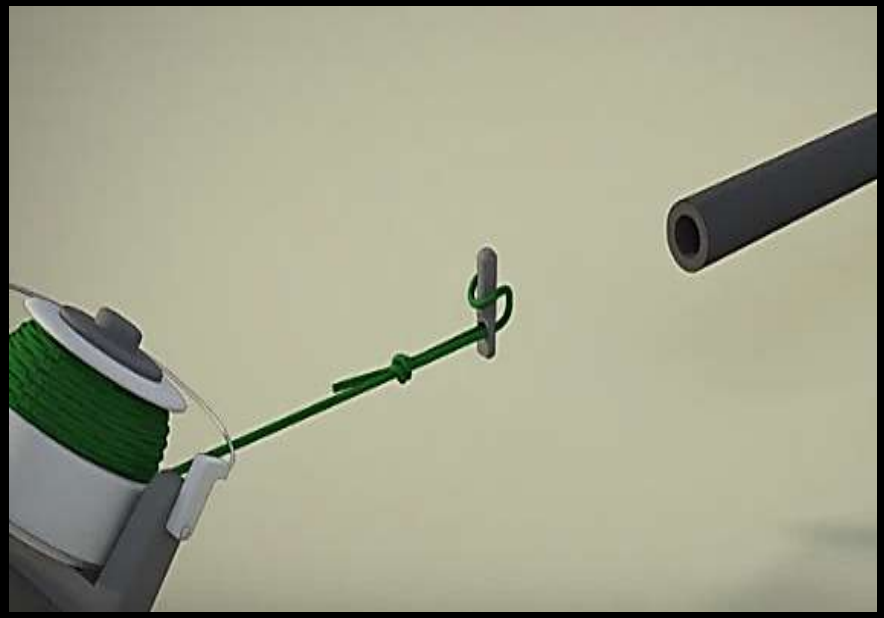

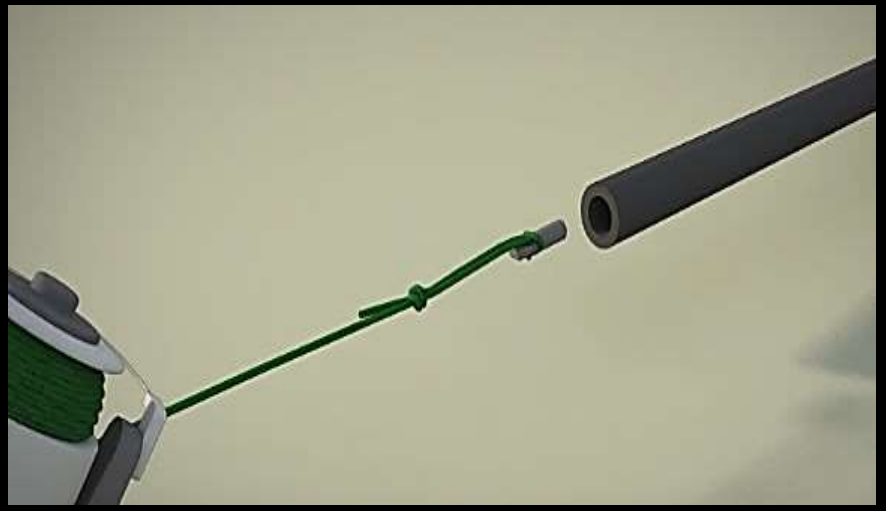

Magnet draws pull through line

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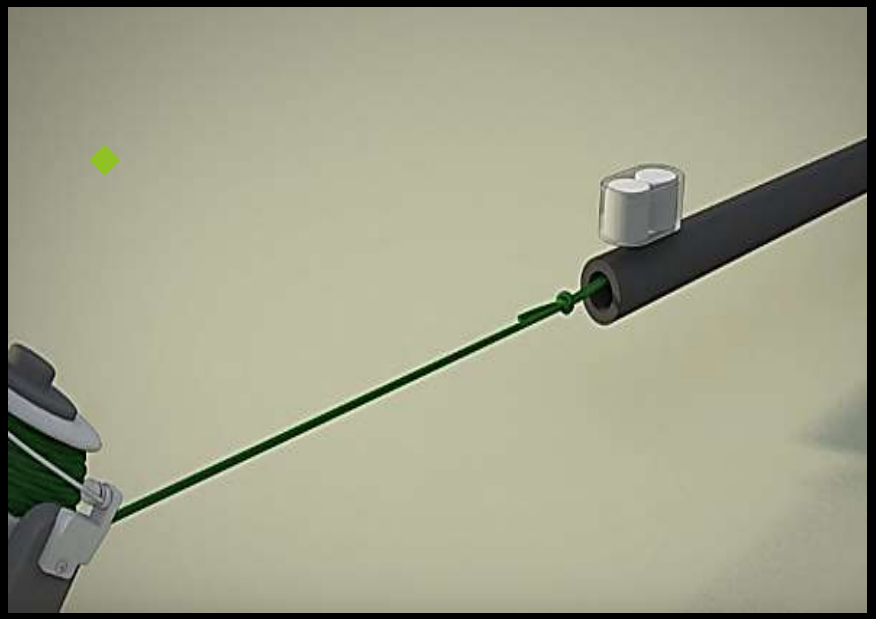
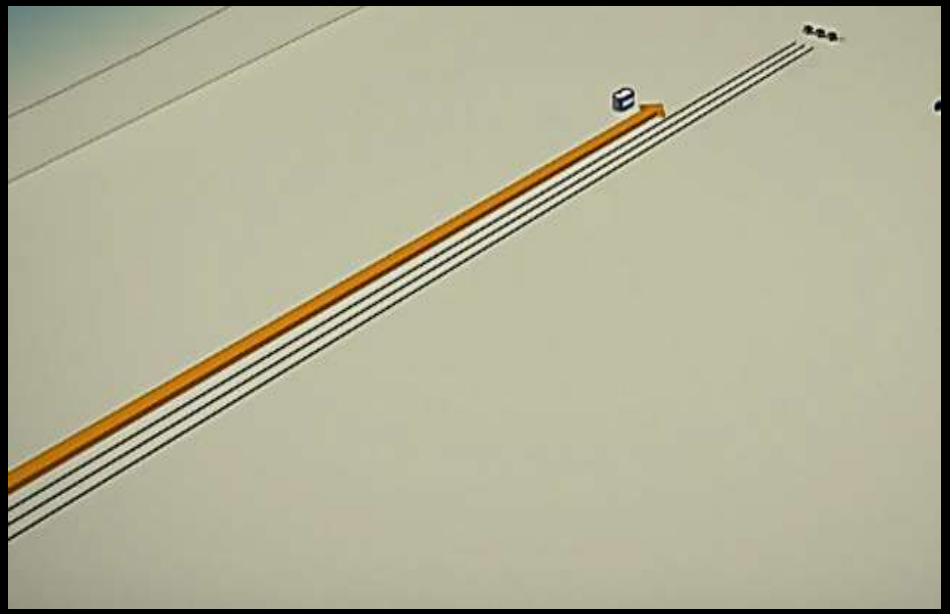
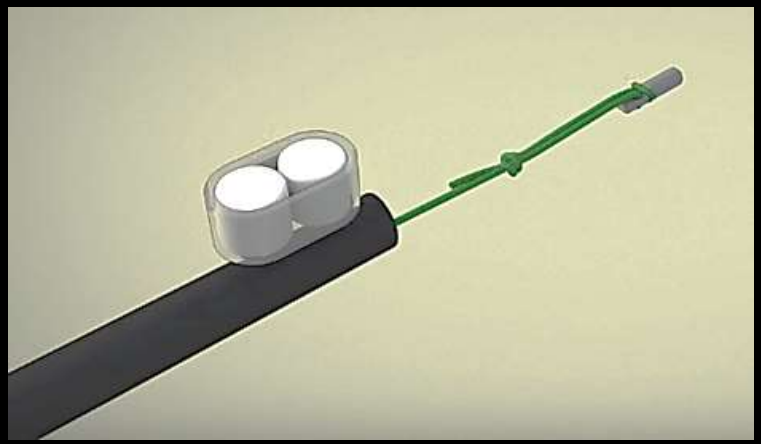
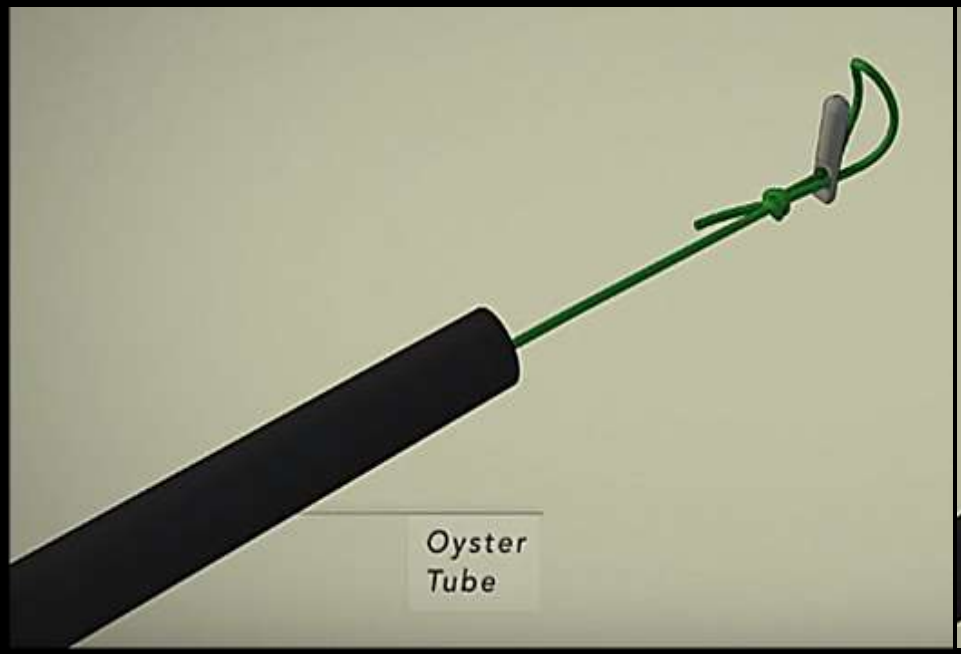
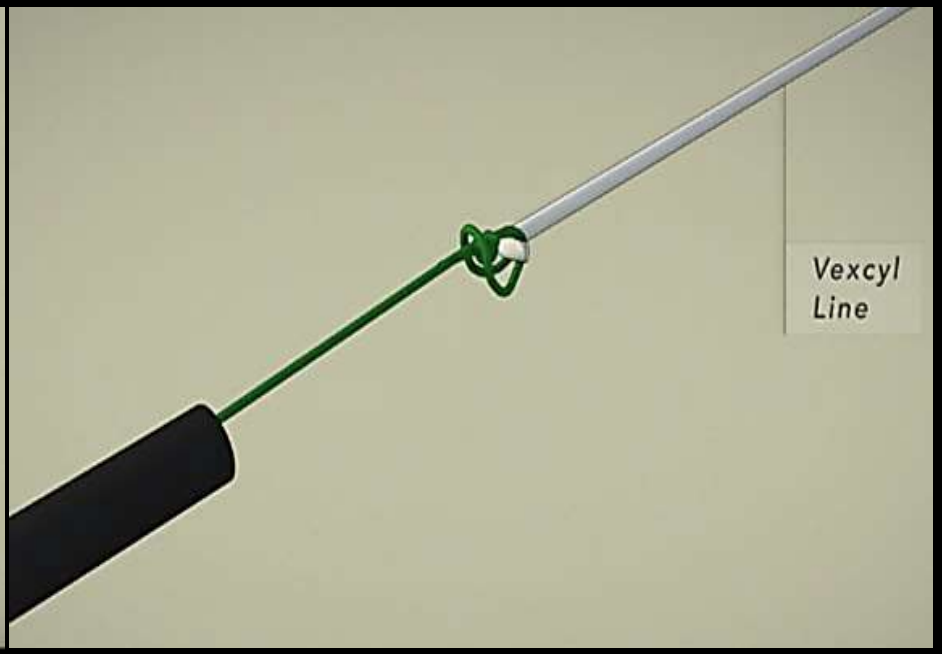


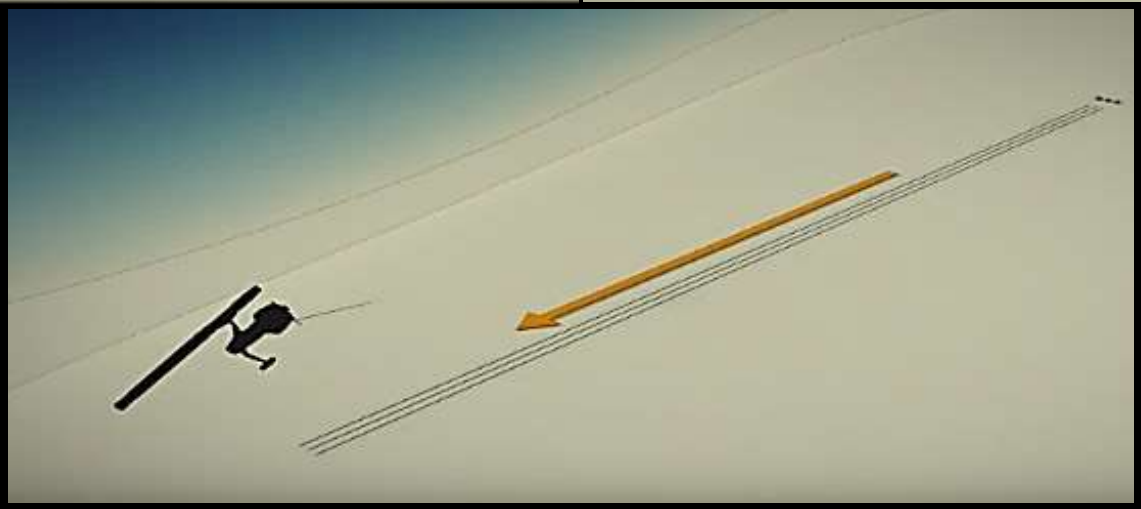




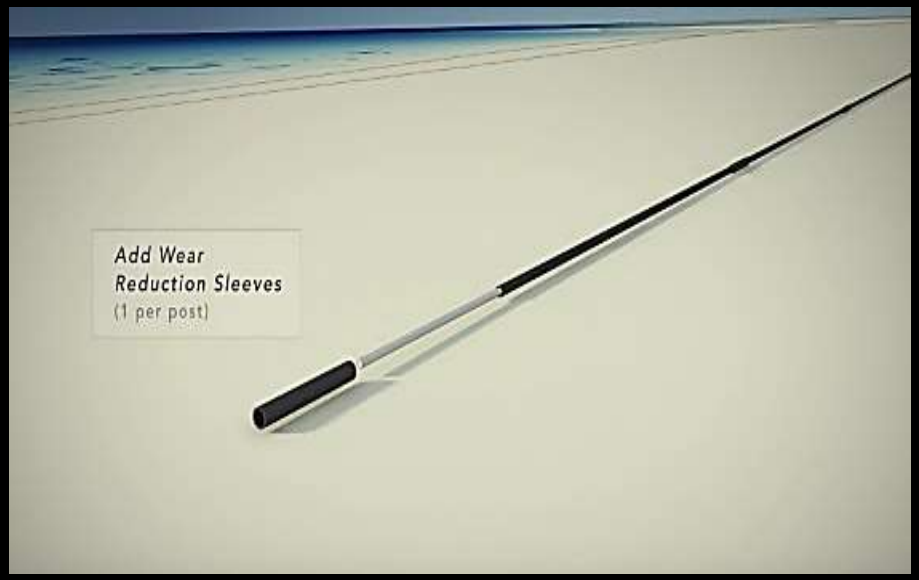
Retrieve Vexcyl line

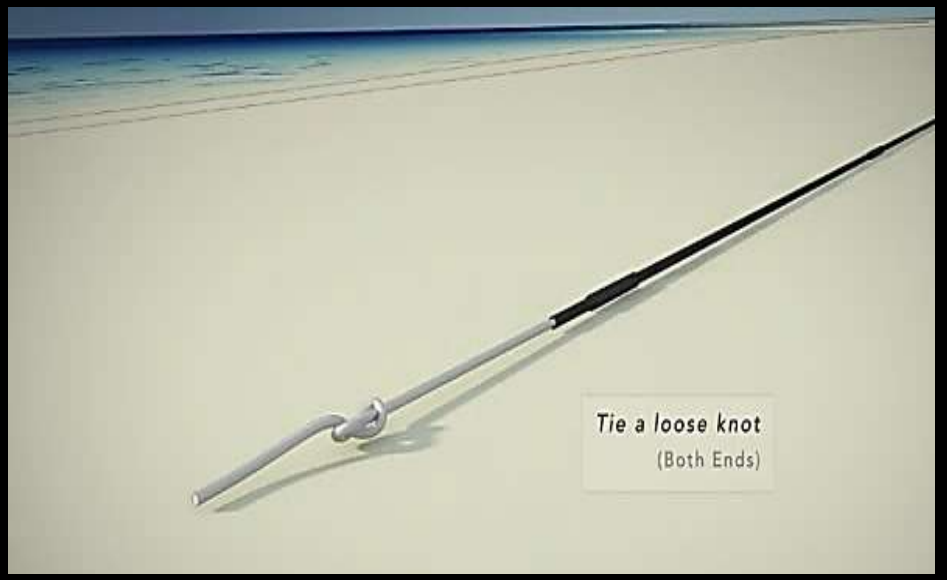


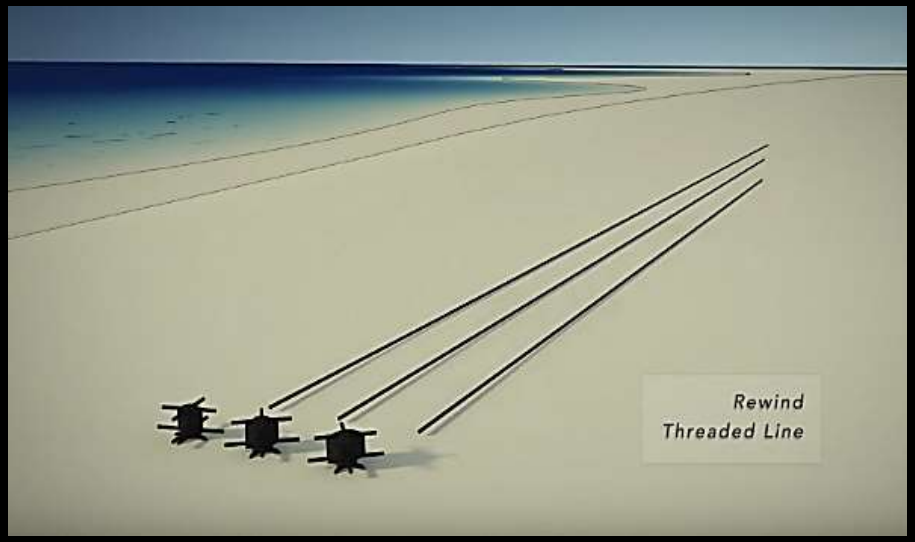




Add wear reduction sleeves







Fix line risers to post

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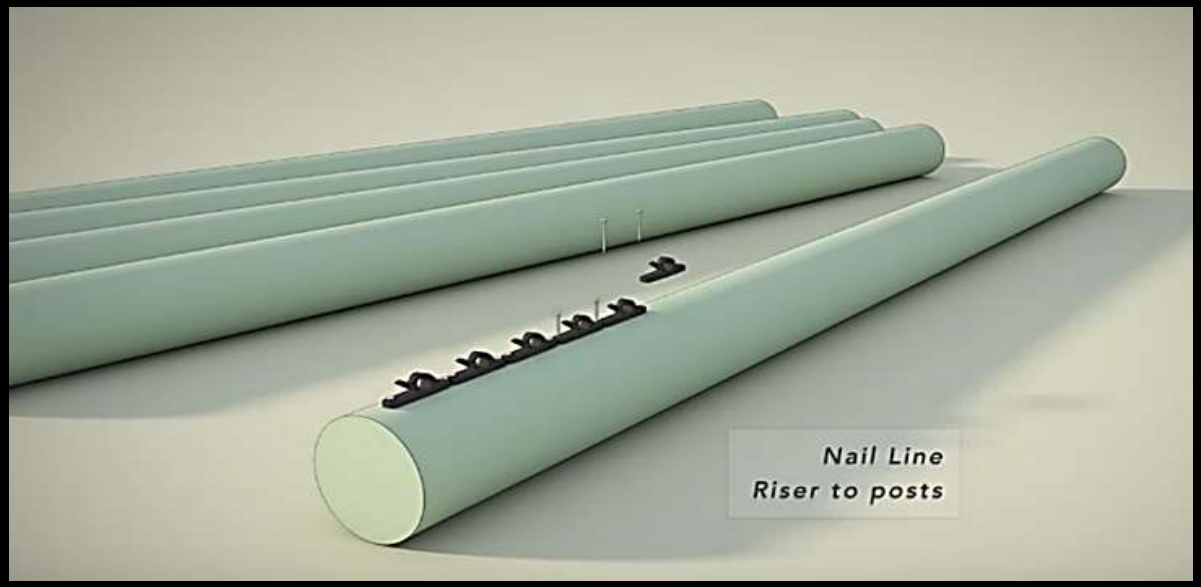
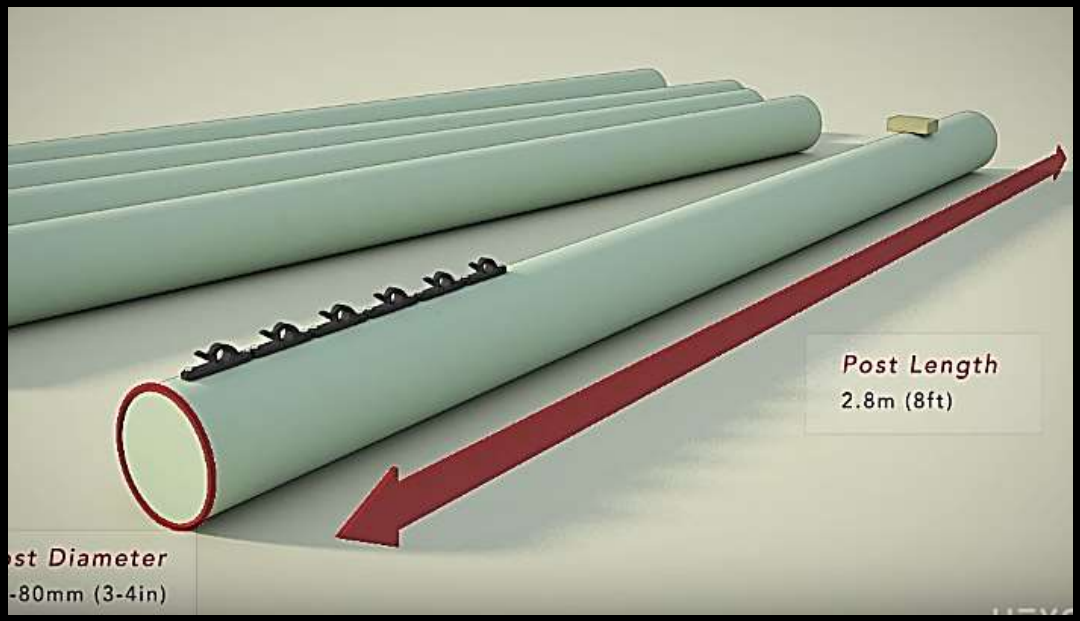
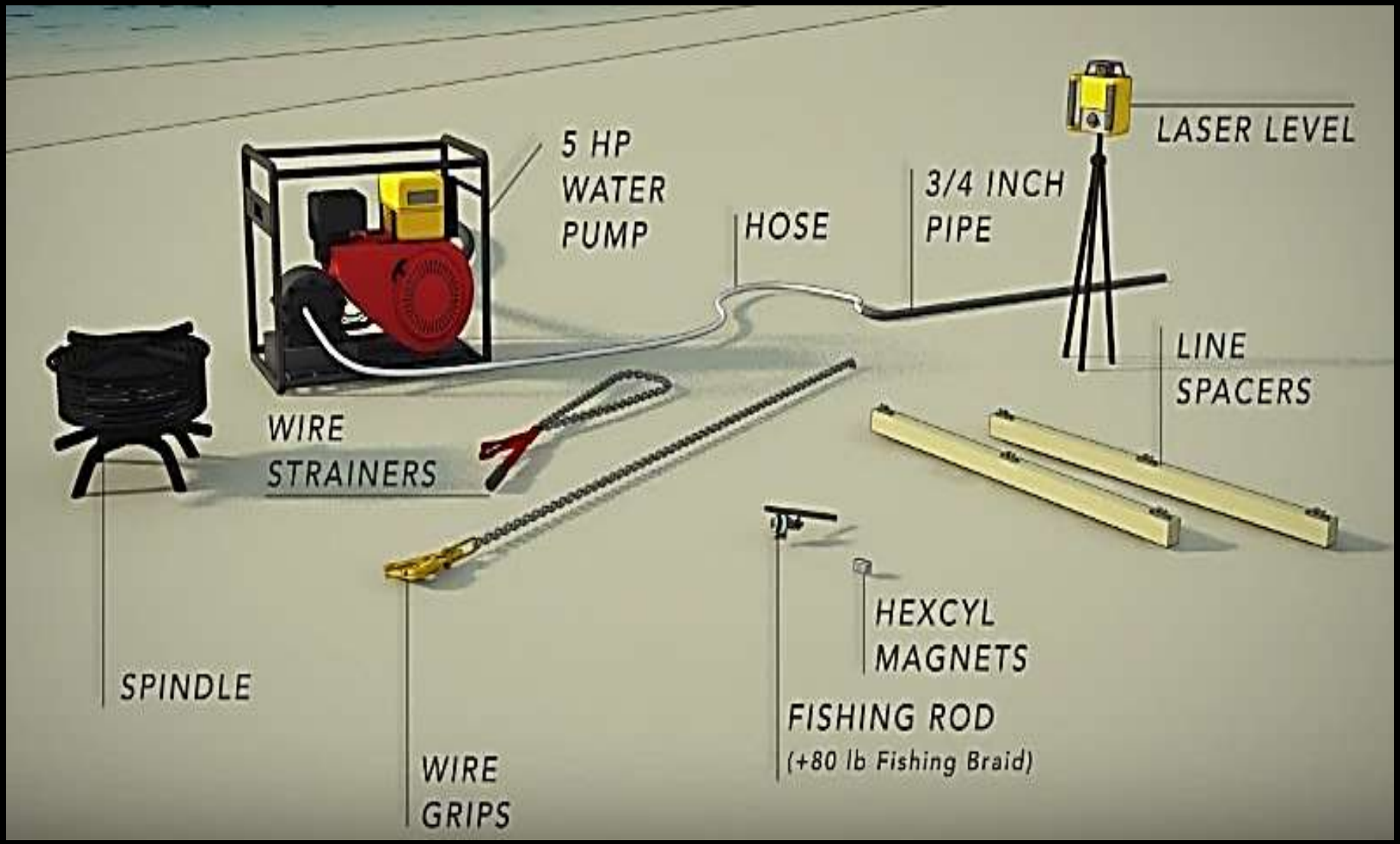
Attaching the Post Risers



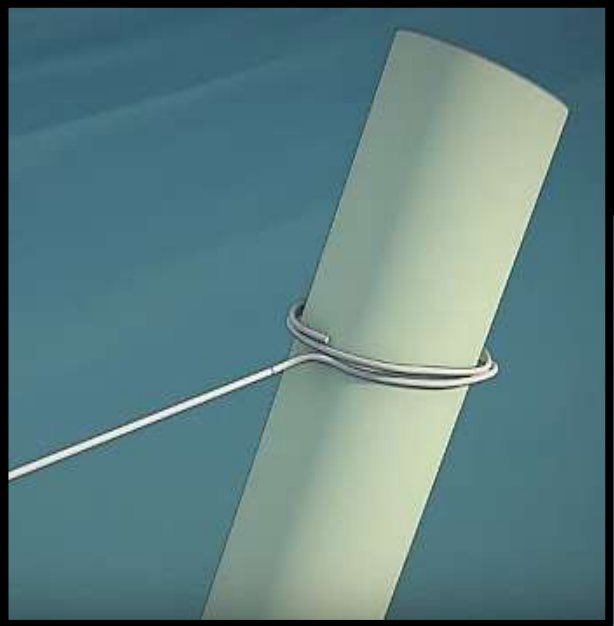


Adjustable longline
construction equipment



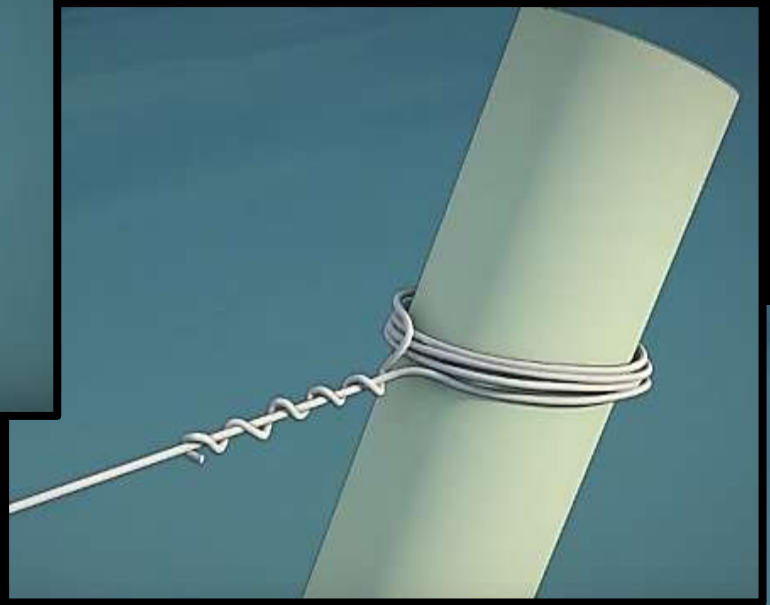
Step 1. Wash in end posts using water pump.
Generally advised to leave several weeks to set in before tensioning lines.

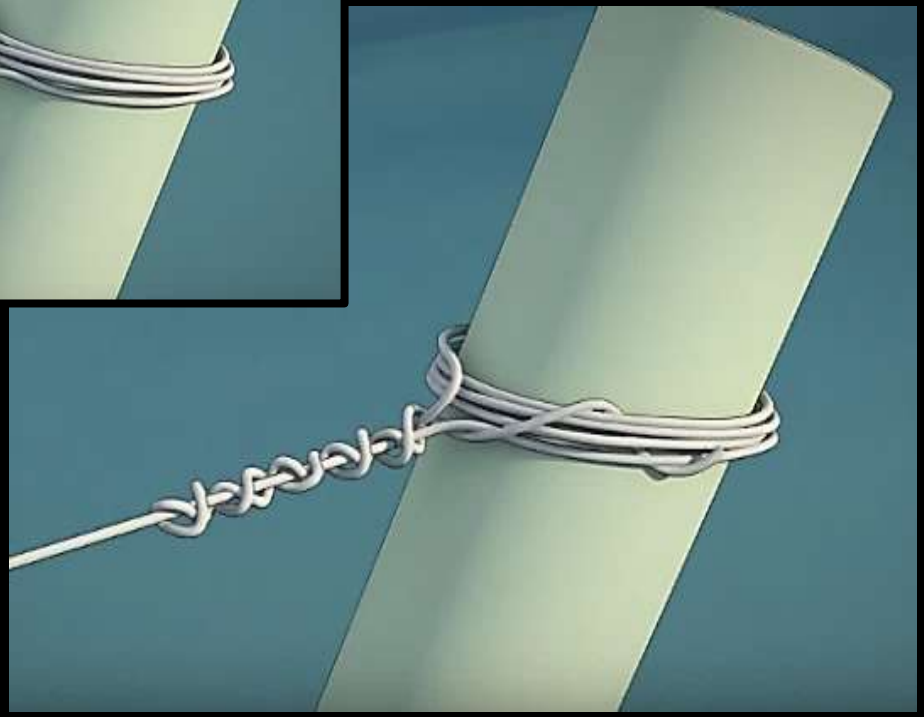
Tie off Vexcyl line



Wrap Vexcyl line 2 – 3 times around end post.

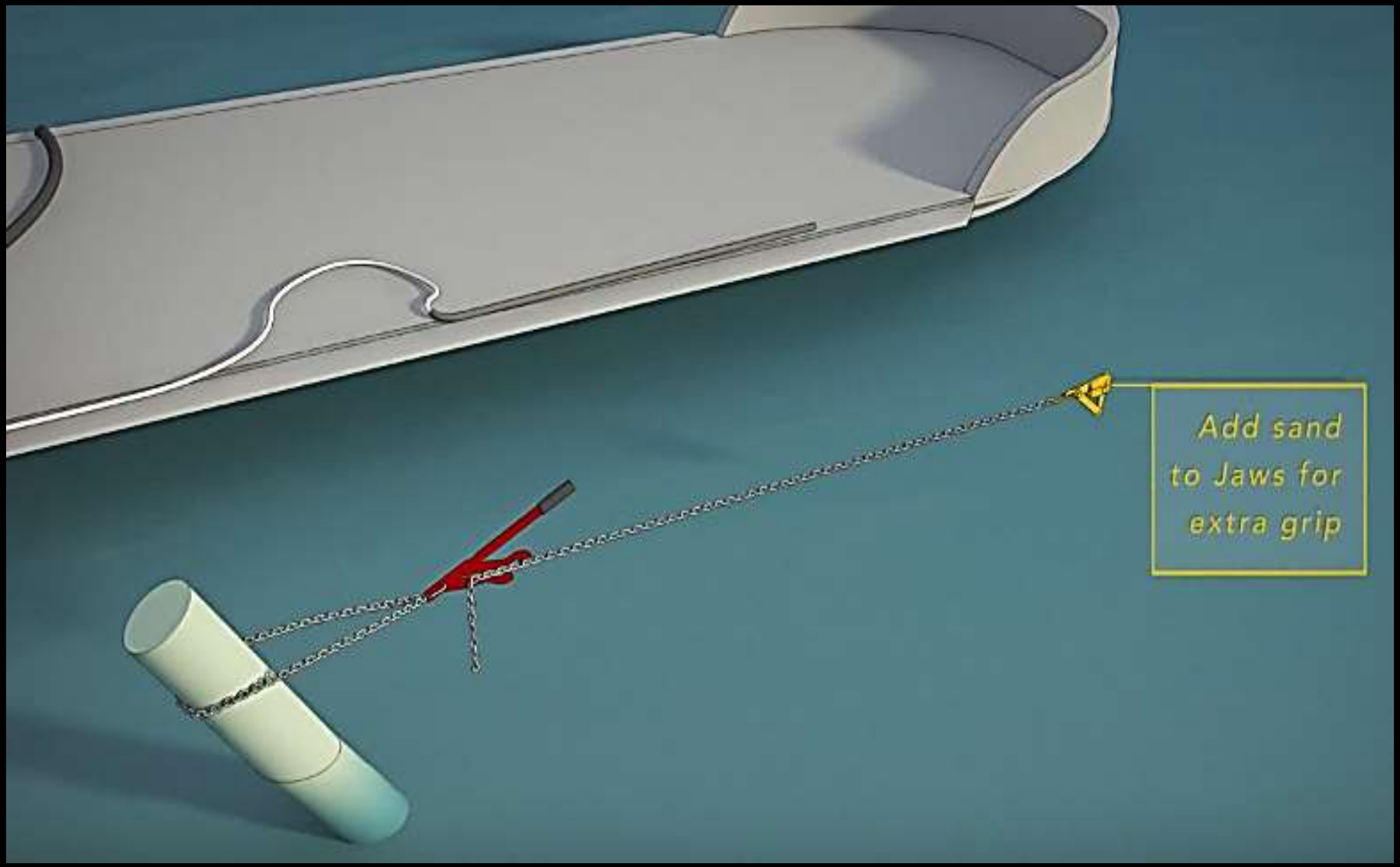
Wind the Vexcyl line back up the main line 5-6 times.



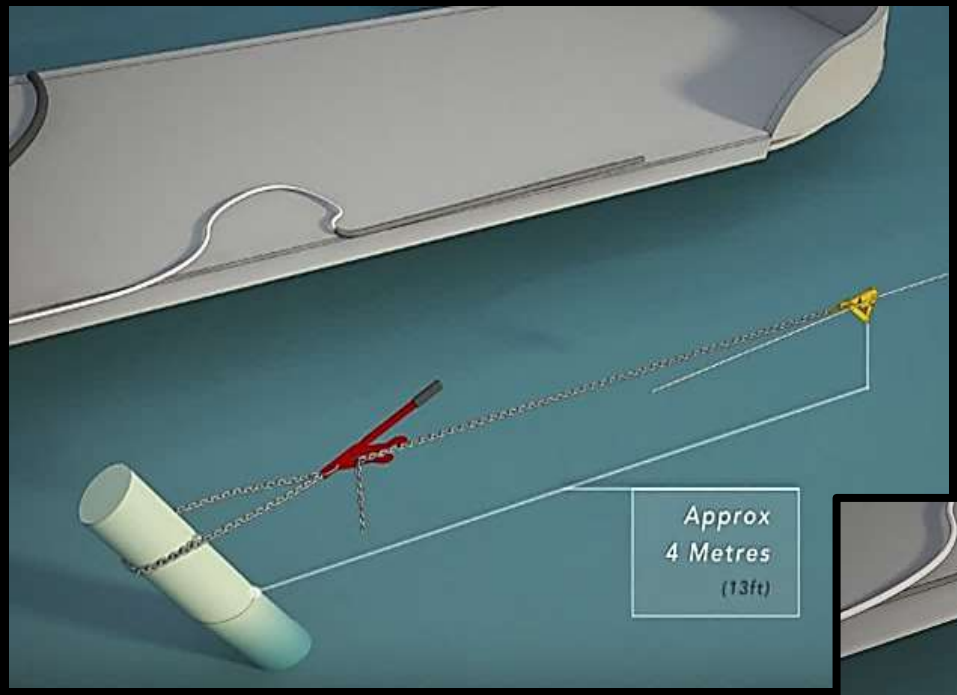


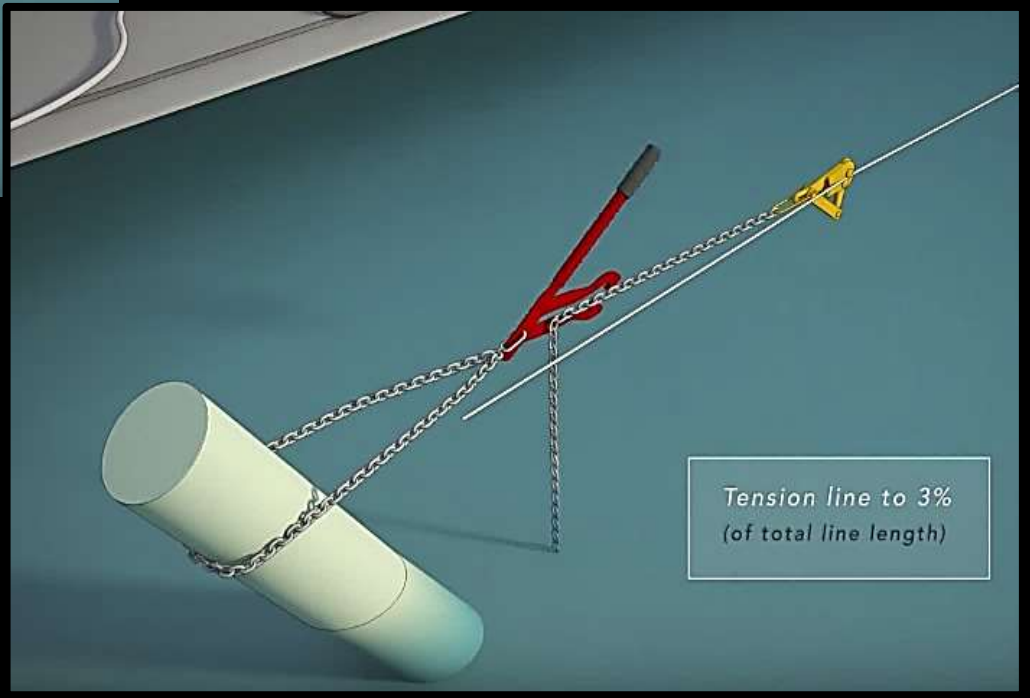
Wind the Vexcyl line back and several times through the loop of line around the end post to terminate the knot.

Attach line tensioner

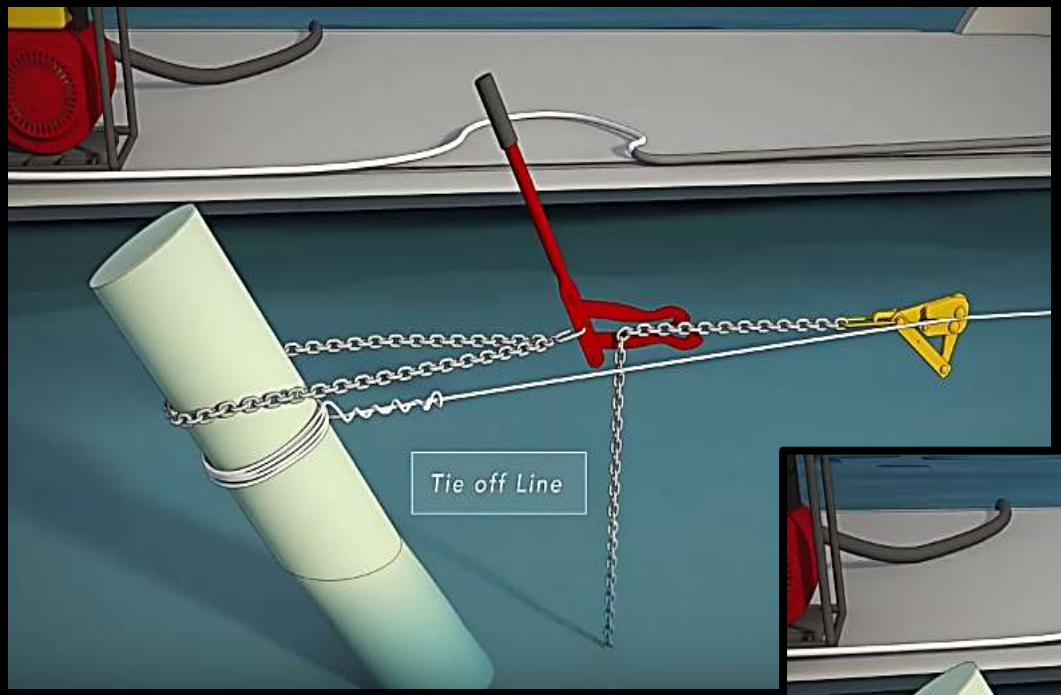


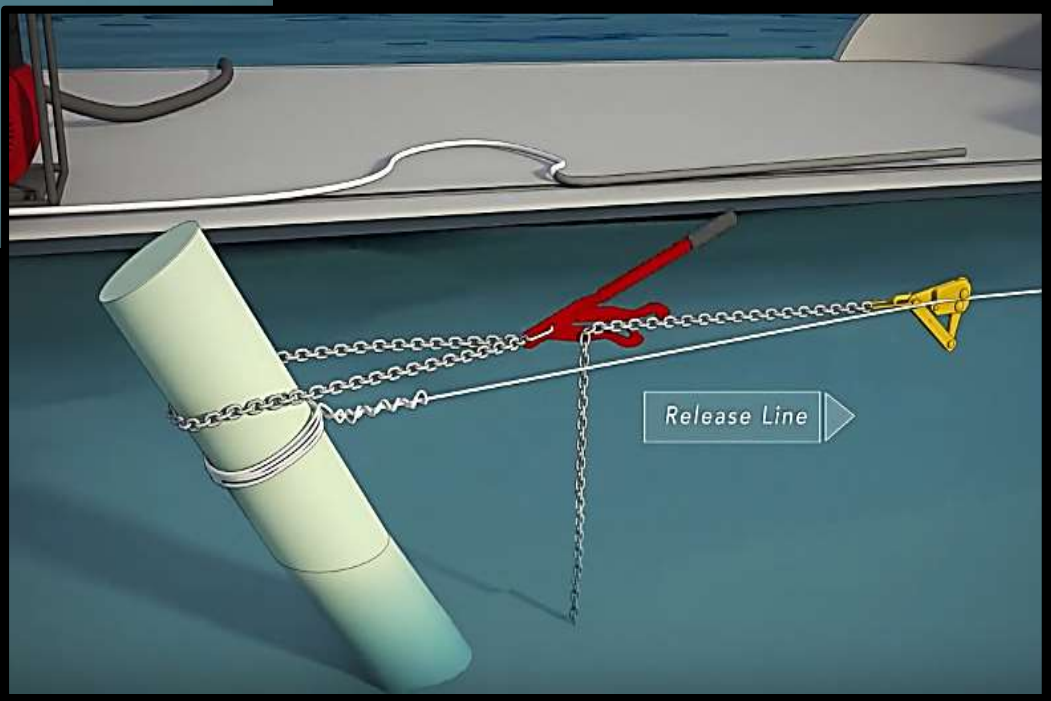
Tension Vexcyl line (3%)



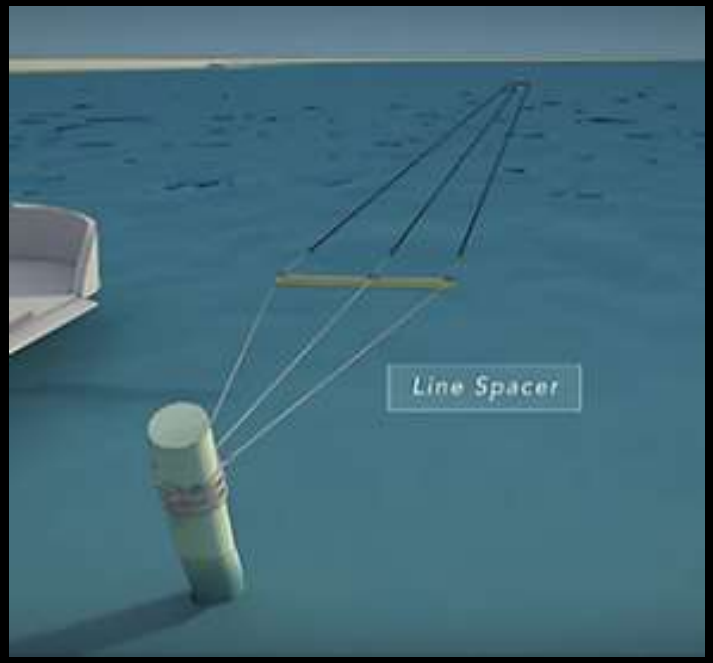


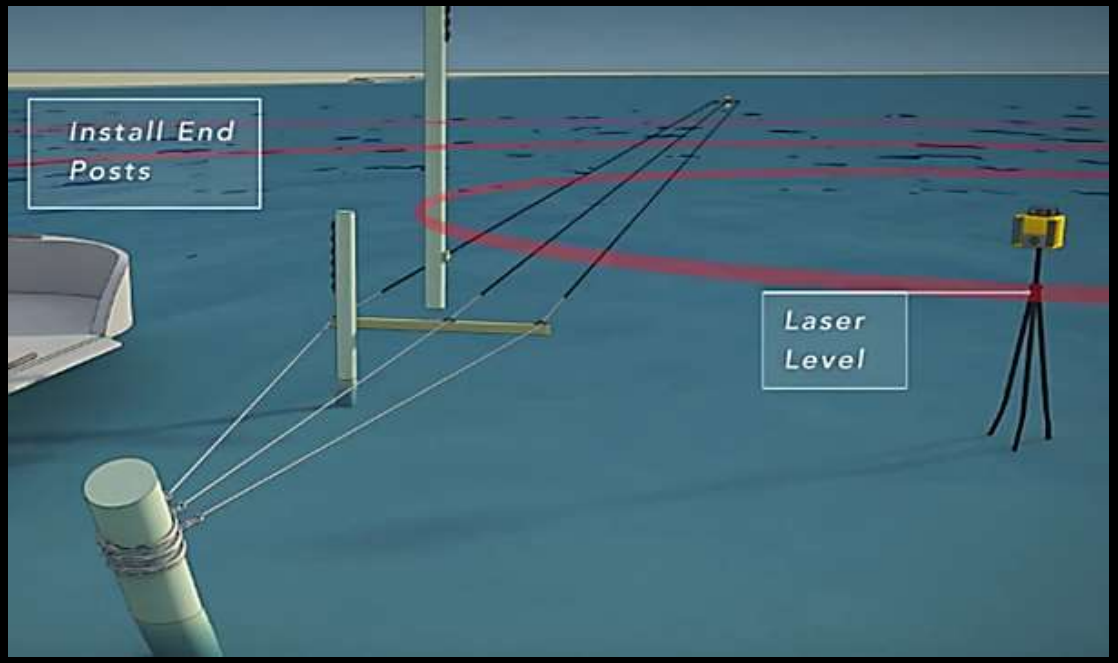
Tie off Vexcyl line

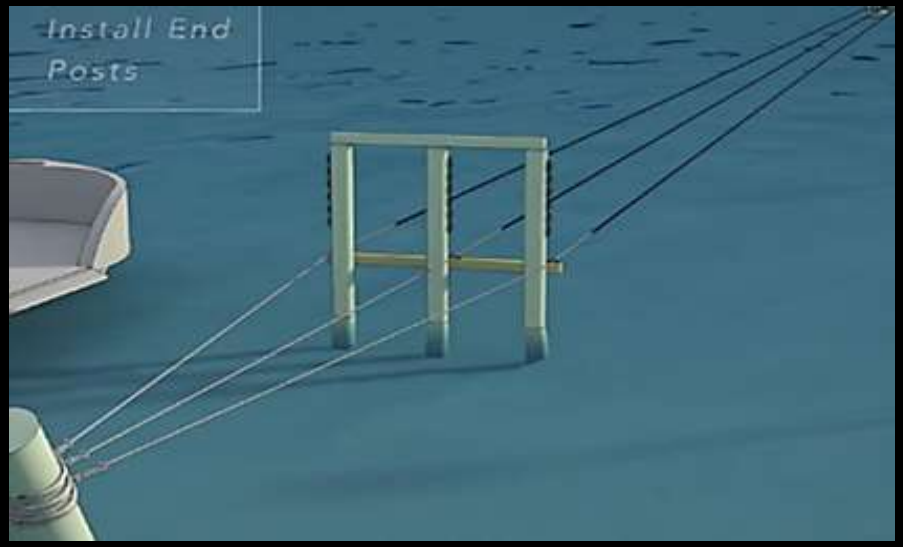


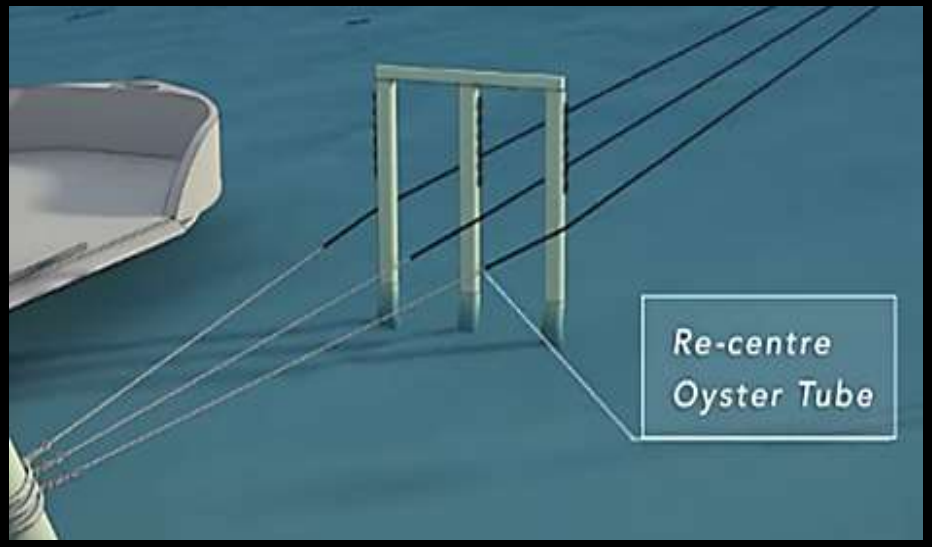


Set up end posts

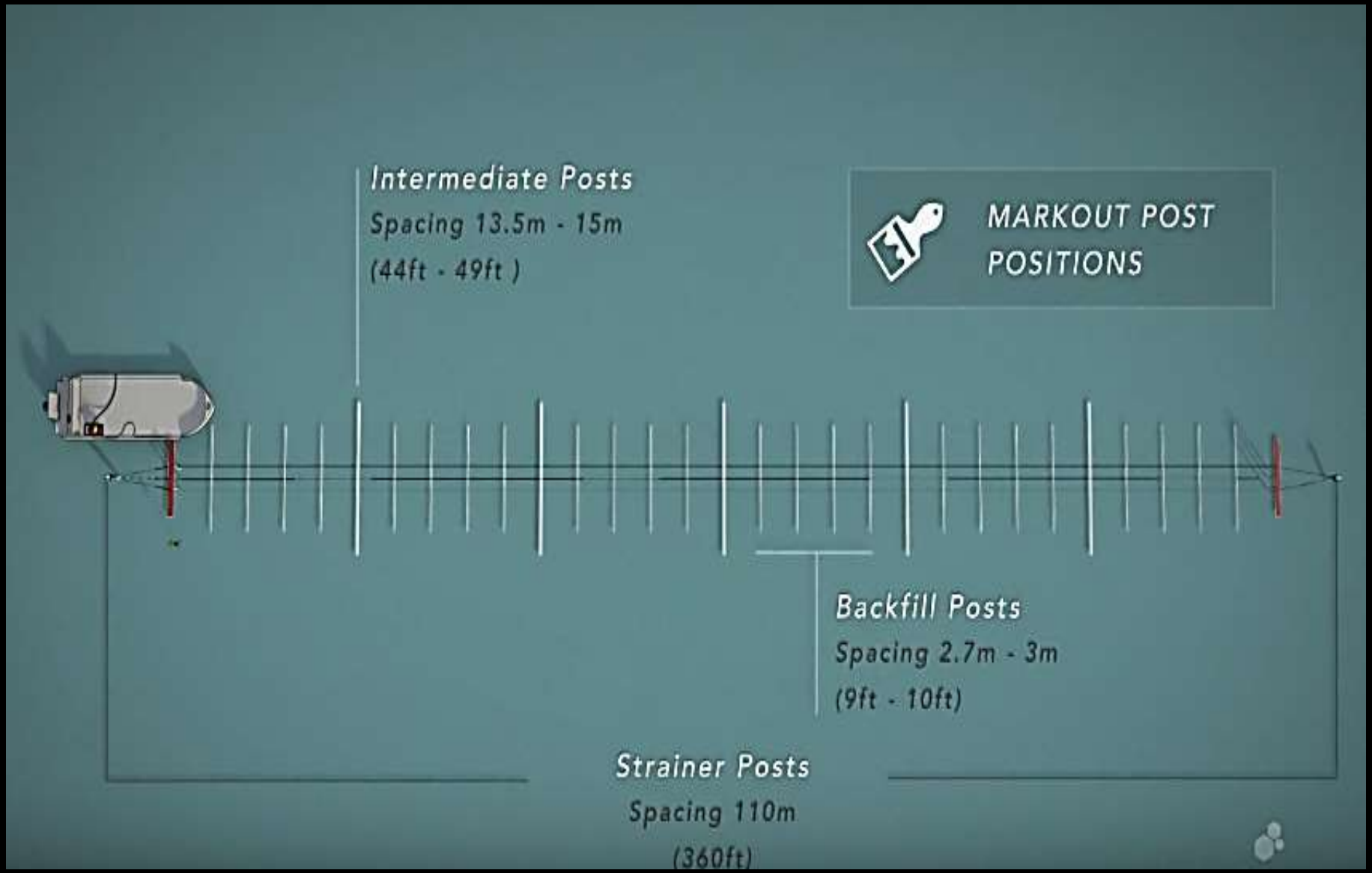




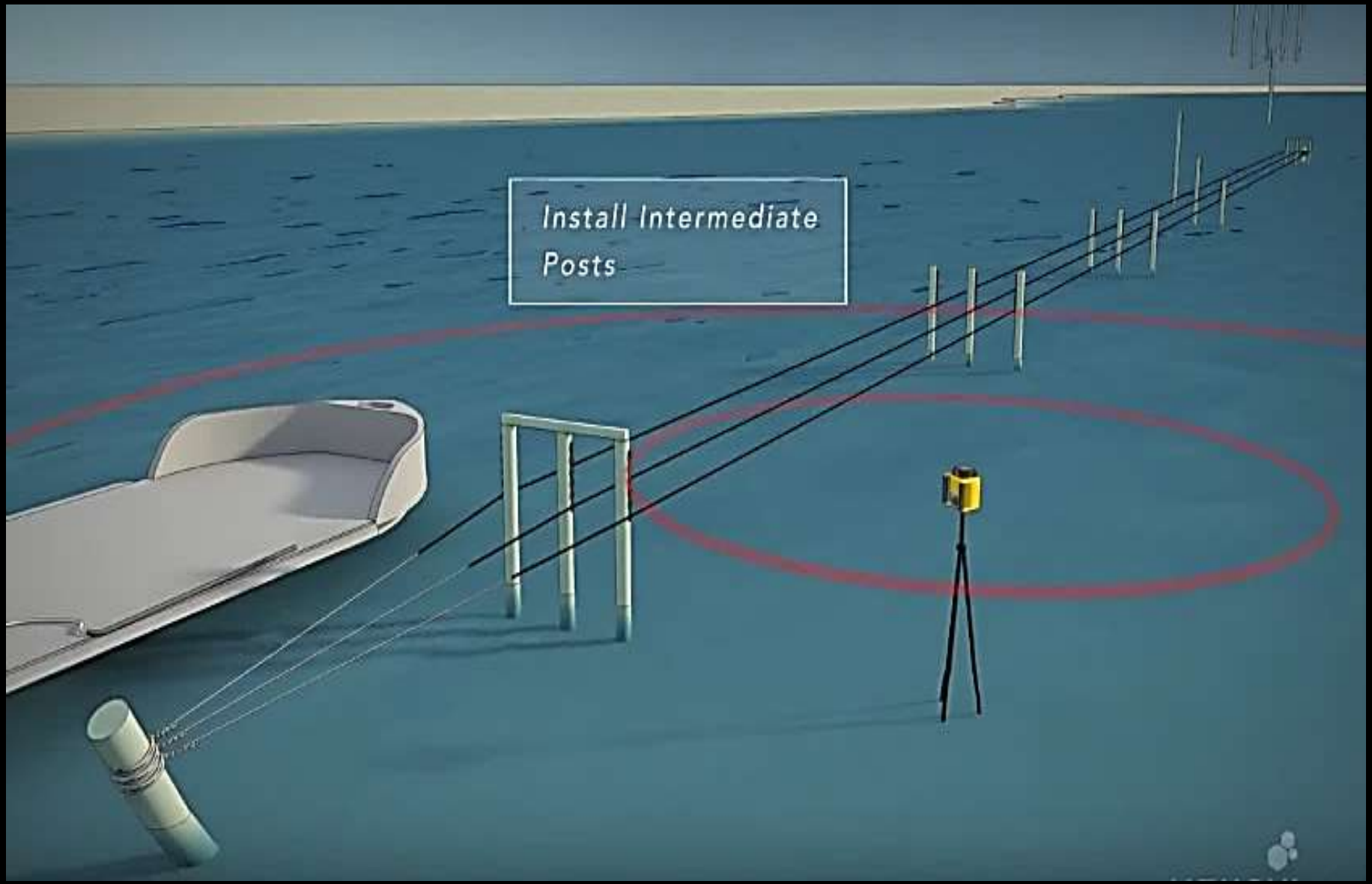




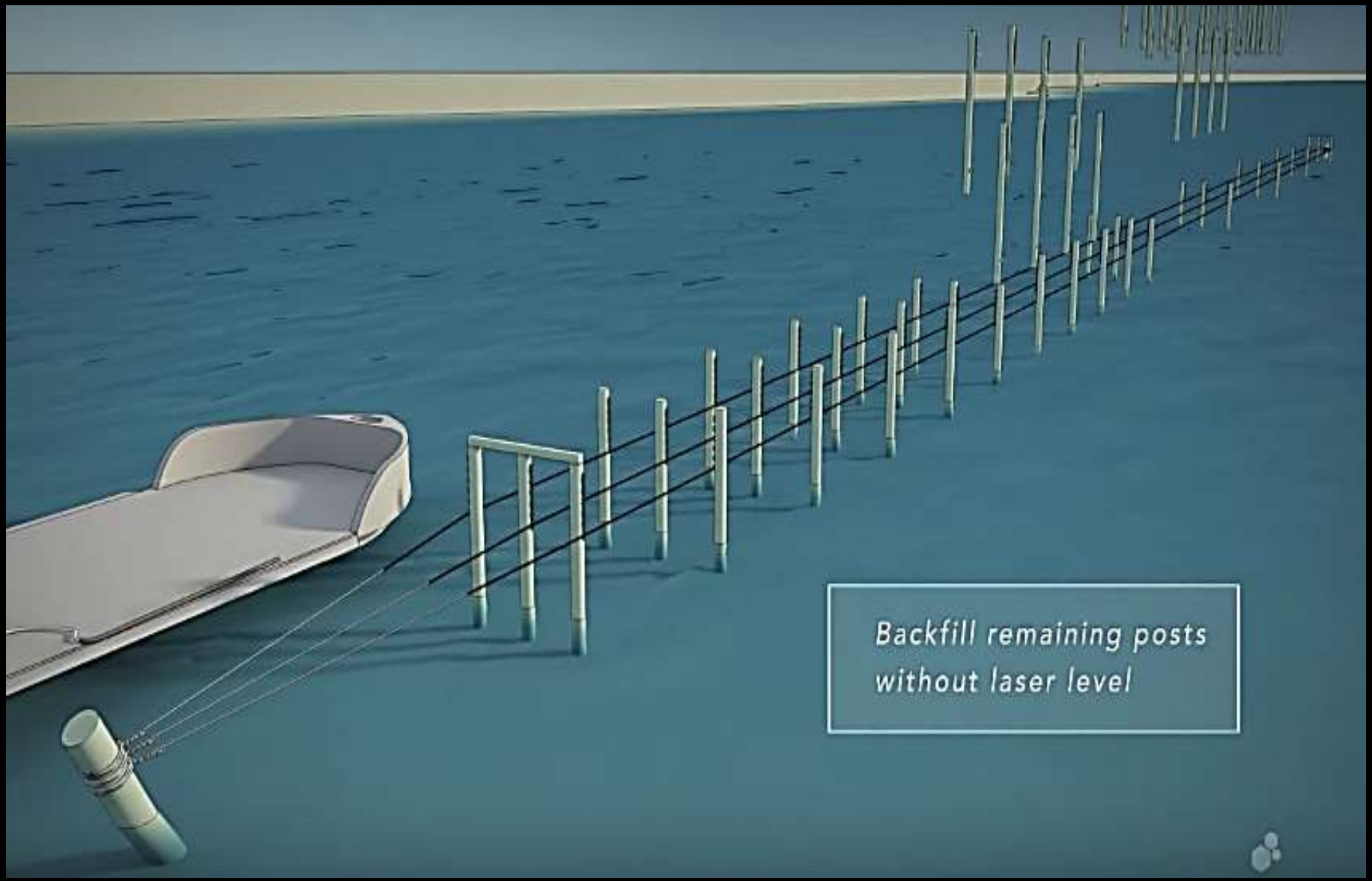
Mark out post spacing



Install intermediate posts



Backfill remaining posts



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