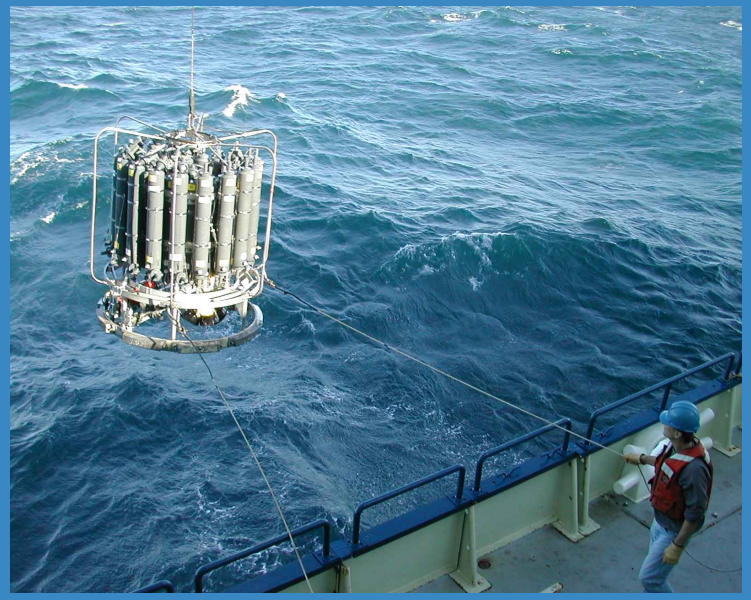
36PL 10L Rosette Improvements



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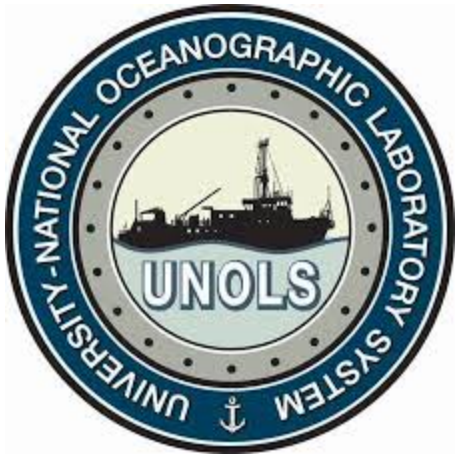
Acknowledgements



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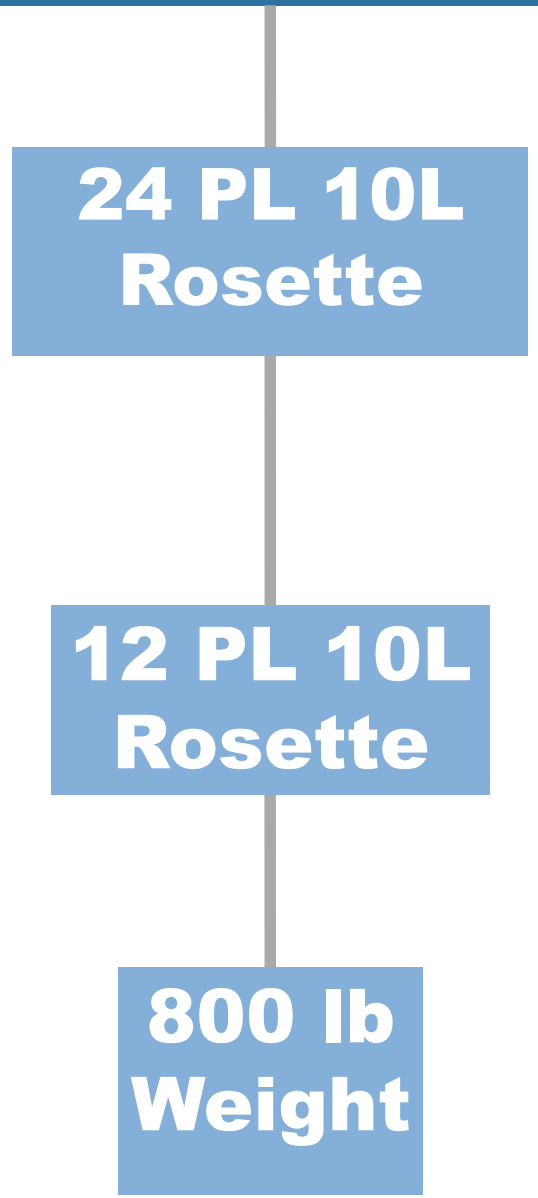
Background

During the 1970's and 1980's large volume hydrographic cruises were conducted using double rosettes.

36 Bottles were obtained by attaching two rosettes to the sea cable separated by ~10M with an 800 lb weight hanging underneath.

During much of this period the standard Sea Cable was a single conductor 5/16" cable.

A Magnetic switch was used to transfer the conductor to the other rosette after the last bottle was fired. The CTD was powered by batteries.



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Previous Innovations

In 1992 General Oceanics first introduced the model 1016 36 place sampling system. Seabird Electronics offered the 36PL Carousel ~1995.

NOAA-Pacific Marine Environmental Laboratory, Scripps Institution of Oceanography and Woods Hole Oceanographic Institution designed and built 36 Place rosette frames in 1992.

The new rosettes solved many problems related to the double rosette system.

The 800 lb weight, magnetic switch and batteries were eliminated and the CTD could be powered down the cable.

CTD casts were done more quickly and safely.

Previous Design Specifications

In 1992 the design specifications for the frame built by Scripps Institution Oceanography were:

- The frame be capable of disassembly so that it could be transported by aircraft.
- The frame be constructed of hollow aluminum tubing to make the frame lightweight and to reduce costs.
- Close bottle spacing in order to make the rosette as compact as possible.
- The weights be formed in removable rectangular lead bricks that can be bolted onto the lower ring of the frame.

SIO 36 PL Rosette

The 36 PL Rosette was a major improvement over the double rosette system but some issues were encountered.

R/V *Knorr* 2002

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Observations From Use

- The hollow tubing used in the frame trapped air which contributed to a “floating” effect upon deployment.
- The flat stock used in the frame along with the combined flat surface area of the lead weights contributed to a higher drag coefficient.
- The close bottle spacing restricted water flow on the downcast resulting in a “parachute” effect and higher drag.

Comparisons to Smaller Rosette Packages

The design issues along with the larger size and weight of the 36PL rosettes resulted in more problems than what were normally encountered with smaller rosettes.

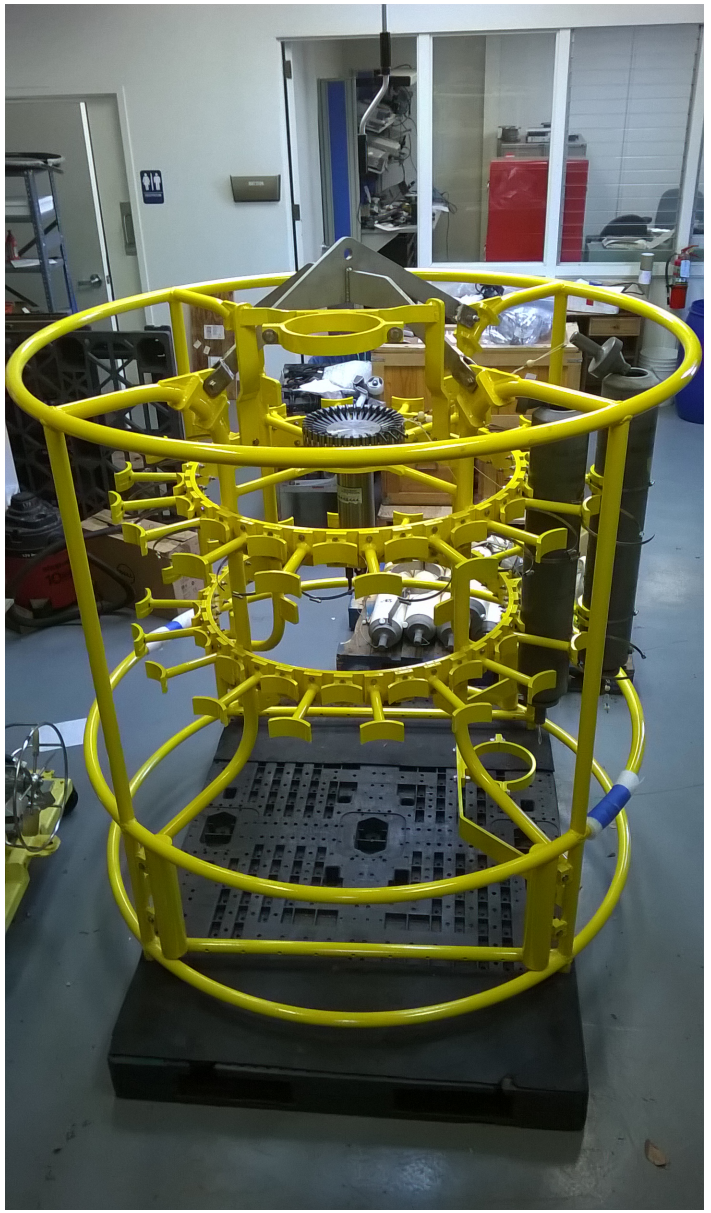
- Higher Cable Tensions
- Reduced ability to sink rapidly during ship roll resulting in slack wire conditions, kinking and cable damage.
- Increased Incidents of wire kinking resulting in more cable re-terminations.
- Higher incidents of z-kinks resulting in the loss of internal electrical conductors in the sea cable.

36PL 10L Rosette Design Specifications 2017

1. Frame structure to be designed as one assembly using all solid core rods.
2. The new frame to have rounded surfaces and streamlined weights.
3. Reduce surface areas as much as possible.
4. Increase spacing between the bottles to allow water to flow more freely.
5. Design instrumentation support bars to allow them to be placed or removed as needed.

New 36PL Rosette Frame

The Rosette was completed in May 2017
Just in time for it's first cruise.



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Comparison of Specifications

New 36 PL		
Height to top of frame	66”	
Height to top of Bridle	74”	
Width	65.5”	
Weight including instrumentation	~1300 lbs	In Air (Bottles empty)
Weight including instrumentation	~2000 lbs	In Air (Bottles full)
Weight including instrumentation	~800 lbs	In Water at Surface

Old 36 PL		
Height to top of frame	68”	
Height to top of Bridle	71”	
Width	66”	
Weight including instrumentation	~1900 lbs	In Air (Bottles empty)
Weight including instrumentation	~2800 lbs	In Air (Bottles full)
Weight including instrumentation	~1200 lbs	In Water at Surface

*All weights were taken from the shipboard tension meter before and during actual casts.

*Instrumentation includes CTD, T&C Sensors, 36PL Carousel, Transmissometer, Fluorometer, Altimeter, Lower LADCP, Upper LADCP, LADCP Battery Packs, UVP

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Expectations of New Design

- Lower Sea cable tensions of about 300-500 lbs.
- Reduced drag.
- Reduced number of cable re-terminations.
- Reduced tendency to “float” or “kite”.
- Ability to better accommodate instrumentation.

Use at Sea on Research Cruises

357 CTD casts were conducted on the R/V Nathaniel B. Palmer during two repeat hydrography research cruises (PO6 and S4P) with this rosette

Observations

- Observed cable tensions have been lower as expected across both cruises
- Added instrumentation can negate the effect of streamlining the package
- Asymmetrical rotations have been observed that vary by depth of cast, location, and conditions

Action Items

- Implement lighter streamlined mounts for instrumentation
- Observe rotations with a different winch, wire, and vessel configuration

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Final Points

Improvements have been made but additional caution is required with 36PL rosette operations

- Compared to a 12 or 24PL rosette, there will still be higher cable tensions and higher drag.
- If an excessive amount of added instrumentation is installed on the frame then it will add drag that will negate the effect of rosette frame streamlining. It will also increase the tendency to “float”.
- Winch speeds still need to be reduced to keep cable tensions within safe operating limits.

Contacts and Questions?

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