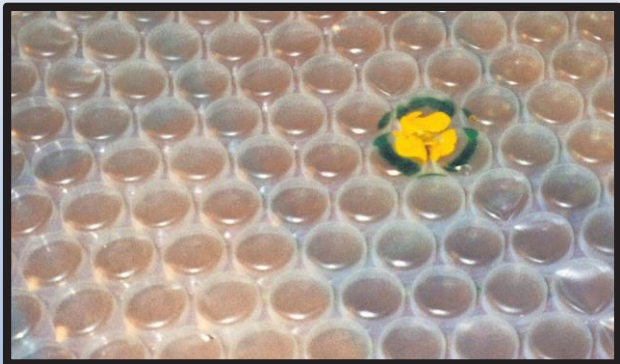


Floating Covers

for Chlorine Dioxide Solution Storage Tanks

“PANACEA”[®]F130BD



PRINCE
RUBBER & PLASTICS CO., INC



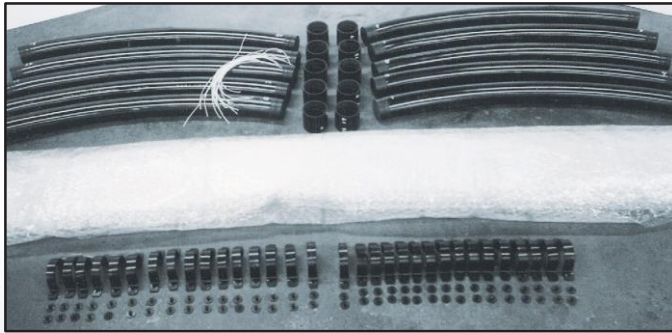
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Advantages

The Advantages of the “Panacea”[®] F130BD Floating Cover Design are:

- P-72 and F-130 materials offer outstanding chemical resistance for long life.
- Thousands of independent flotation cells for long term floatation reliability.
- The F-130 membrane has very low permeability to gases, for high gas barrier performance.
- Complete stability in operation.
- Ease and simplicity of installation.
- All parts are easily passed into the tank via existing manway.
- Can be reliably fabricated to any size required.
- Ease of maintenance and repair.
- Parts are easy to assemble, and easy to pass through tank manway.



Floating Cover Design

1. The Membrane

The F130BD design is produced by extruding, thermoforming, and welding two films of **Panacea**[®] F130 fluoroplastic together, trapping air in multiple encapsulated cylinders. The air provides great buoyancy. Specific gravity of F130BD is approximately .05, and the manufactured widths of F130BD are 48”.

These widths can be welded together side to side to achieve widths of any desired measurement. Lengths of **Panacea**[®] F130BD can be processed to any manageable and shippable dimension. The covers, including sizes of 50’ or 60’ in diameter are easily fabricated.

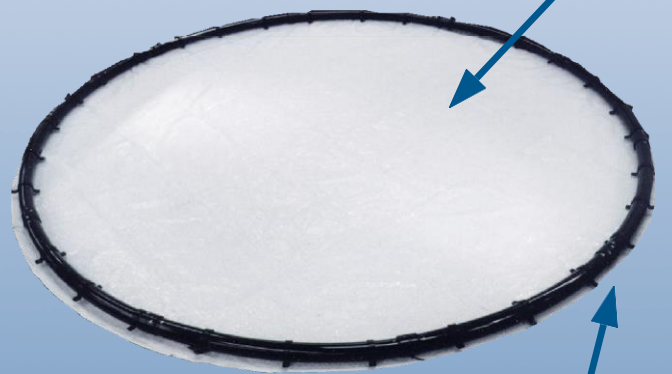
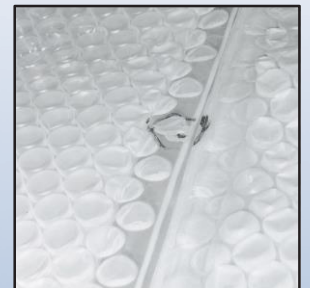
The membrane design incorporates small holes in the cover allowing for drainage of liquid on top of the cover and elimination of any large gas bubbles from under the cover.

2. Circumferential Stiffening Hoop

The **Panacea**[®] F130BD material requires a “stiffening hoop” to maintain its shape in a CLO² storage tank. The stiffening hoop is constructed of individual rigid P-72 pipe segments. The segments are thermoformed to the required radius, and capped both ends for floatation. The segments are then joined in the tank with easy-to-assemble P-72 couplings and fastened to the cover with a P-72 quick connect system.

3. Repair

Sections of the **Panacea**[®] F130BD cover, if damaged, can be cut out and replaced with **Panacea**[®] F130 film, **Panacea**[®] F130BD, and mechanical plastic or titanium fasteners with hand tools. No special equipment is required.



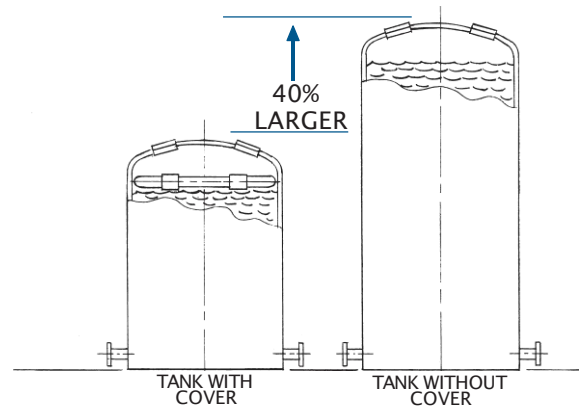
Benefits of an F130BD Floating Cover

Financial Benefits

- Can store up to 40% more concentrated ClO_2 solution in storage tank with cover than without.
- Chill up to 28% less chlorine dioxide solution for substantial power and equipment savings.
- Energy savings of 25% or more on steam when utilizing $33\frac{1}{3}\%$ stronger chlorine dioxide solution.

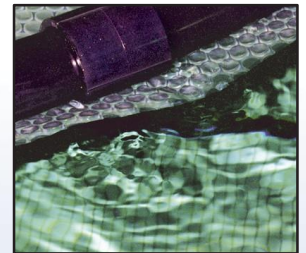
Example:

- Original storage strength without cover = 9 to 10 gm/l ClO_2
- Concentrated storage strength with cover = 12 to 14 gm/l ClO_2
- The “concentrated” storage strength of ClO_2 solution is $33\frac{1}{3}\%$ (or more) higher than the maximum “original” storage strength without a cover.
- The energy required to heat concentrated ClO_2 solution is 25% less cost to the bleachery.
- i.e. - a 30 ton per day ClO_2 plant can save up to \$329,619 annually when steam costs = \$7.50/1,000 lbs., and ClO_2 solution strength is increased from 10 gm/l to 14 gm/l.



Environmental Benefits

- The Panacea® F130BD cover will reduce ClO_2 emissions from the storage tank up to 98%. Reduced emissions will dramatically decrease the plant’s scrubber requirement, size of the scrubber needed and the amount of scrubber liquor required.



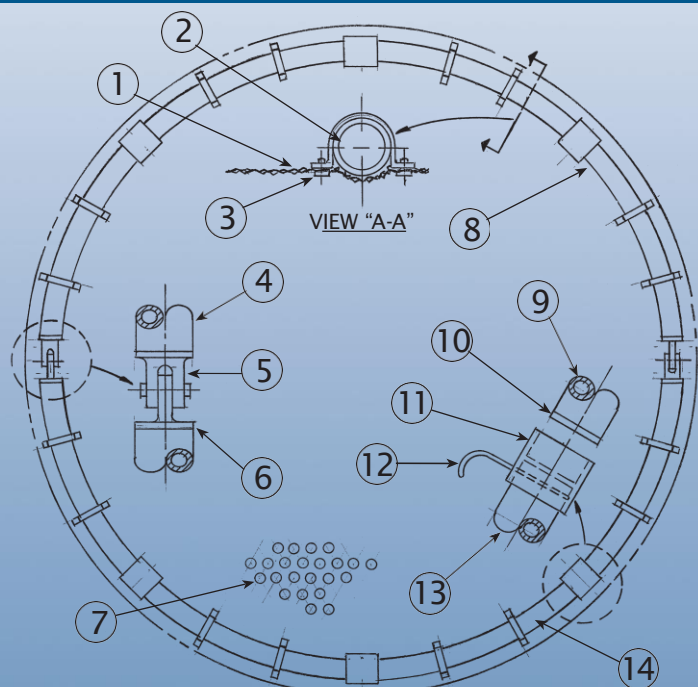
Safety Benefits

- Safety —during power outages or other air sweep problems, the lack of an air sweep in the tank could lead to dangerously high concentrations of chlorine dioxide fumes in the top of the storage vessel. The Panacea® F130BD floating cover greatly reduces the rate of build-up of chlorine dioxide gas in the top of the tank, thereby extending the period of time during a power outage or equipment failure where dangerous conditions are avoided.

F130BD Floating Cover

Typical Construction Illustration

1. F130BD Membrane
2. P-72 Pipe Ring
3. “U” Band w/Fasteners
4. P-72 Pipe Ring (Segments)
5. P-72 Rotating Clevis Joint (Optional)
6. Pipe Segment Seal
7. F130BD Membrane
8. All Pipe Segments Sealed for Flotation
9. P-72 Pipe Ring Segments
10. Pipe Segment Seal
11. P-72 Connector
12. Reusable Hoop Fastener (Both Ends)
13. P-72 Pipe Ring (Segments) This End Shown Assembled
14. Circumferential Stiffening Hoop



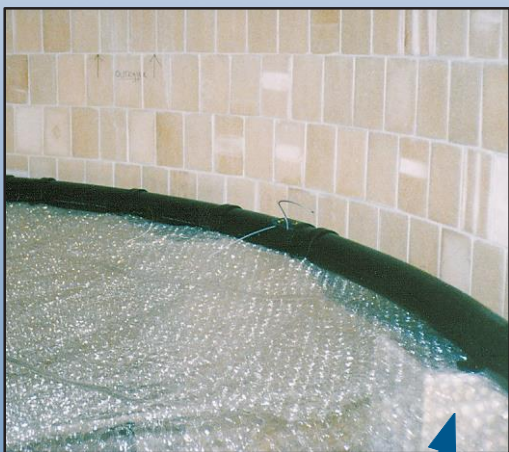
PANACEA® F130

F130 —A special flouropolymer material

Physical Properties		
Tensile strength	D638	3300 psi
Flexural modulus	D790	30,000 psi
Hardness, shore D	D2240	54
Limiting oxygen index	D2863	75
Maximum use temperature		130°C
Minimum use temperature		-50°C
Weight of F130 @ .015"		.16 lb/sq.ft.

Comparative Permeation Data					
Gas	Dimension	PTFE	FEP	PFA	Panacea® F130
Water-vapor	g/M ² xdxbar	.5	.1	.8	.1
Air	CM ³ /M2xdxbar	200	60	115	23
Oxygen	"	150	290	N/A	55
Helium	"	3500	180	1700	153
(Note: 1mm thickness at 23°C) d=day					

Chemical Resistance	
Chemical	Results
14 gm/l CLO ² Solution	Good
Panacea® F130 has been tested for chemical resistance on the following relevant chemicals, at concentration of 10 to 250 times the strength found in CLO ² tanks.	
Chemical	Results
Formic Acid	Good
Methanol	Good
Tributyl Phosphate	Good



Typical hoop support shelf used when protuberances are present at the bottom of tank.