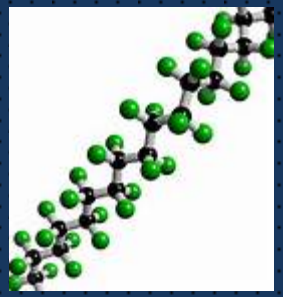
PRINCE
RUBBER & PLASTICS CO., INC

Clorosur IX Technical Seminar

Use of Fluoroplastics to extend life of Special Elastomer Seal Systems in Diaphragm and Membrane Cells



Presented by: Shane Fast
Prince Rubber & Plastics Co., Inc.

PRINCE
RUBBER & PLASTICS CO., INC

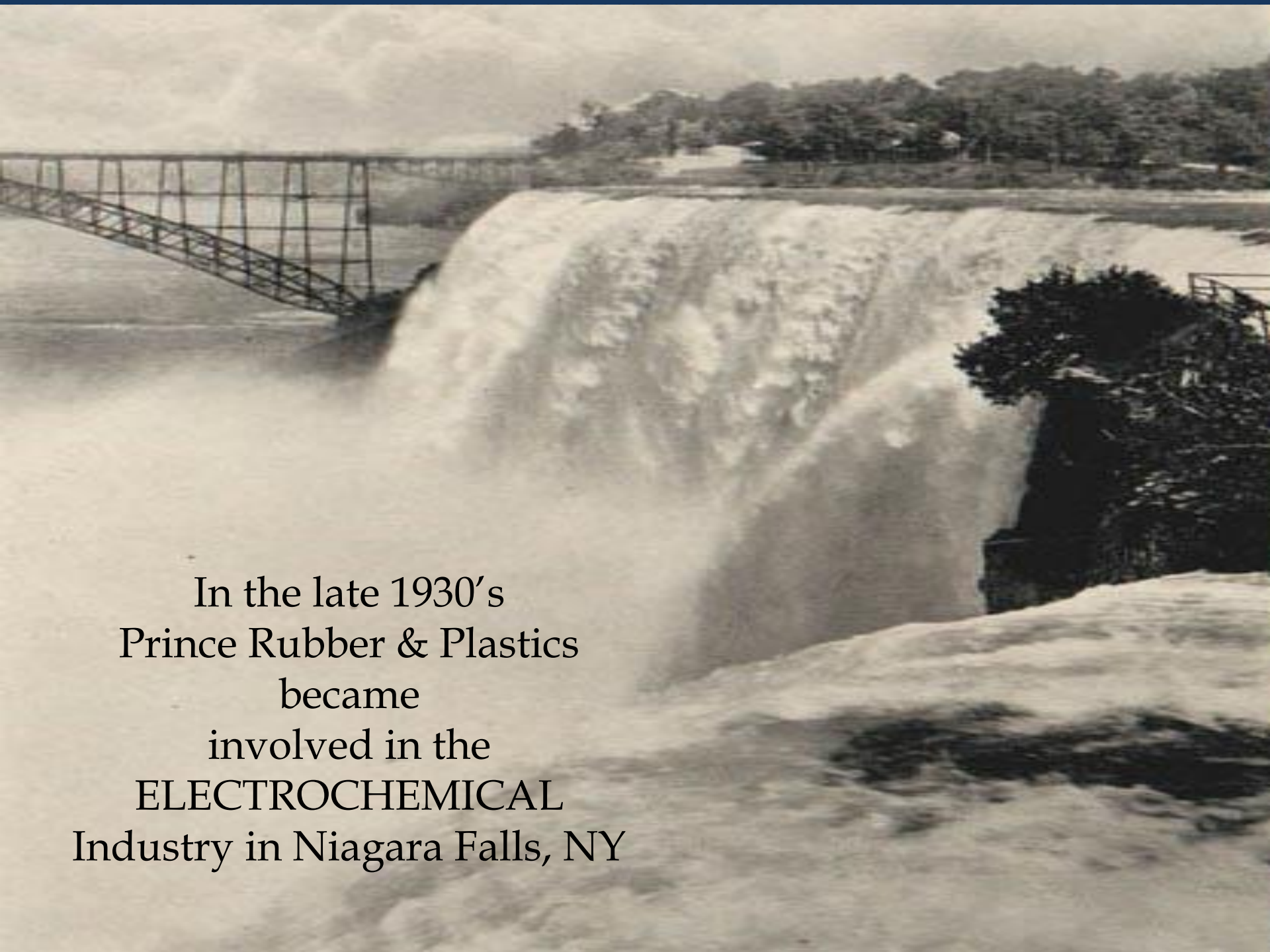
In our 83rd Year

Headquarters: Buffalo, New York, USA

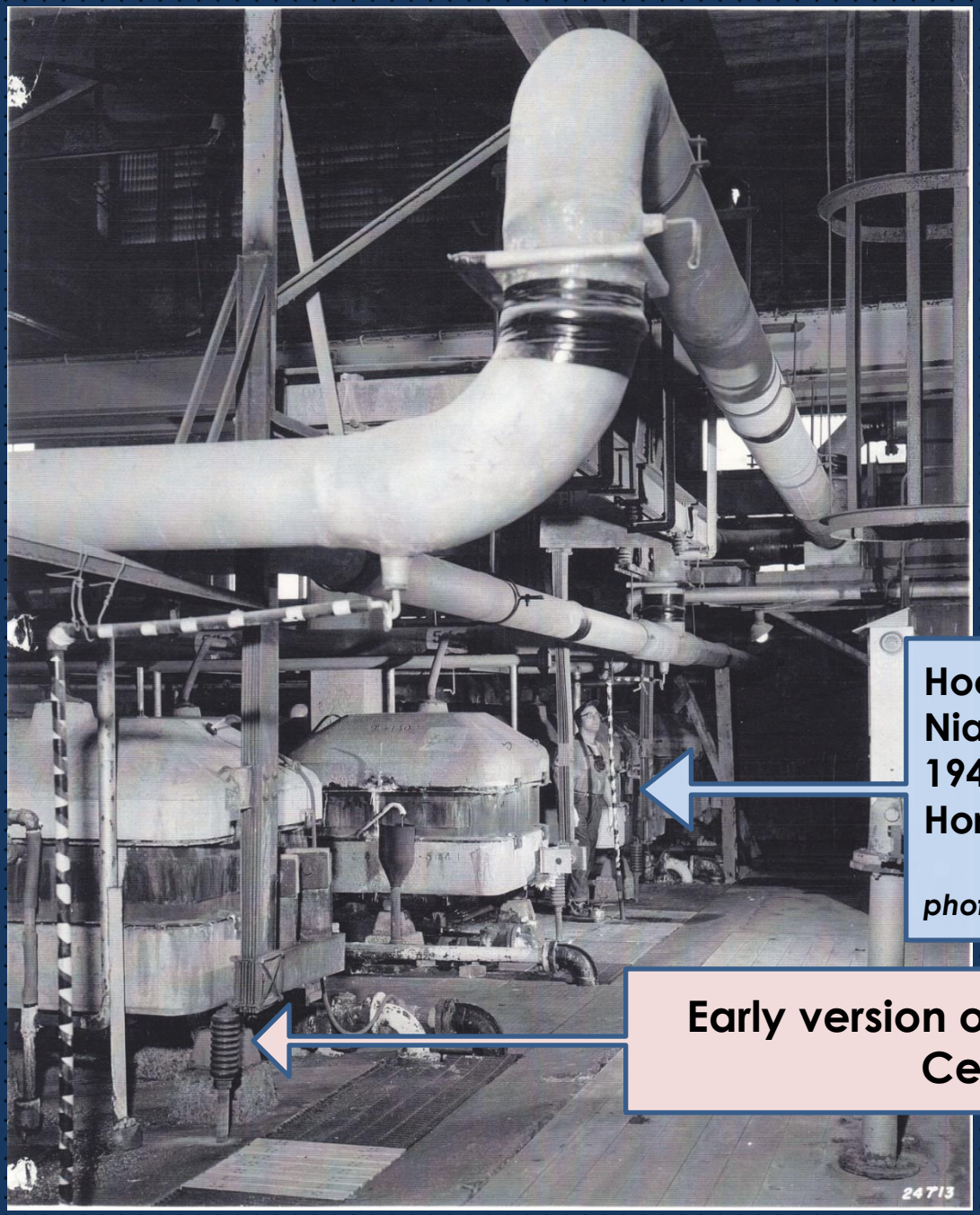
Panacea®
Solutions for Technology in Chlor-Alkali Cell Accessory Parts

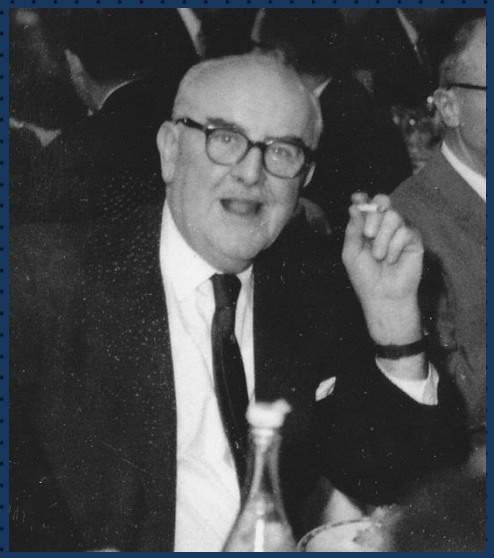
Southern Division:
Baton Rouge, LA, USA

Canadian Division:
Industrial Plastics Canada Limited
Fort Erie, Ontario, Canada



In the late 1930's
Prince Rubber & Plastics
became
involved in the
ELECTROCHEMICAL
Industry in Niagara Falls, NY





Prince Rubber & Plastic Co., Inc.
Founder, Sidney W. Prince

Hooker Chemical Site in Niagara Falls, NY circa 1940's with Horace Hooker

photo taken by Sidney W. Prince

Early version of Chlor-Alkali Cells

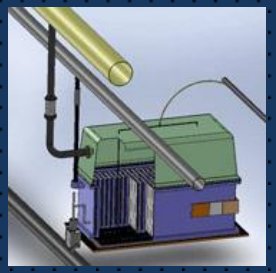
Hooker "S" Cell: Concrete Cell Head – Graphite Anode

From Process to Process, Prince has extensive experience:

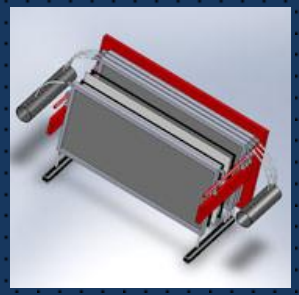
Mercury

Diaphragm

Membrane



Diaphragm Cell



Membrane Cell

Prince Supports the advancements of Chlor-Alkali Technology

What we need to know about
"EPDM Rubber"

- EPDM is a terpolymer of ethylene, propylene, and diene.
- EPDM rubber products are vulcanized and reinforced.
- Vulcanization is a chemical process by which the physical properties of natural or synthetic rubber are improved.
- EPDM Rubbers and many other elastomers are not "Standard" items.
- There are several "EPDM" polymer manufacturers.
- Every rubber products manufacturer must develop a formulation of rubber compound, based on their needs.

General Comparison of Curative Packages for EPDM

Sulfur Cured

- Intermediate Sulfur crosslinks
- Relatively less expensive
- Good general chemical resistance
- Heat Resistance to 260°F (127°C)
- Poor Compression Set
- Deterioration of physical properties over time with heat and moisture (sulfur migration)

Peroxide Cured

- Direct & more frequent carbon crosslinks
- Relatively more expensive
- Excellent general chemical resistance
- Heat resistance >320°F (160°C)
- Good Compression Set
- Excellent retention of physical properties over time with heat and moisture

6962 Special EPDM Physical Properties

6962
SPECIAL EPDM PEROXIDE CURED

Representative Physical Properties			
	ASTM	MANDREL MADE	PRESS CURED AND MOLDED
Compound No.		6962M	6962
Hardness — Shore "A"	D2240	62 ± 5	60 ± 5
Tensile, P.S.I.	D412	1900	1800
Elongation %	D412	350	350
Compression set 70 Hrs. – @ 212°F	D395(B)	25%	25%

Advancements in Technology

- EPDM Poymer Advancements
  - Polymerization methods
  - Catalysts
- Fluoroplastics
  - Contain fluorine bonds on polymer chains
  - PTFE, PFA, FEP, ECTFE, PVDF, others
- Combining Rubber & Plastics
  - Firms typically specialize in one or other
  - Prince has always been involved in both

Currently in regular production:

- 4-6 Specialty EPDM compounds.
- 2 Specialty Fluoroelastomers.
- 1 Specialty high temperature thermoplastic.
- 1 Specialty high temperature thermoset plastic.
- 4-5 Fluoroplastic variations.

What fluoroplastic materials does Prince use with rubber seals?

Prince uses Fluoroplastics that have:

- High temperature capability
- Excellent resistance to cracking (have long flex life)
- Excellent all around chemical resistance
- Permeation resistance
- Weldable (important in some cases)
- Prince is capable of bonding fluoropolymers to rubber products

Examples: Prince Plastic/Rubber Products

- Mark III HB fluoroplastic/Special 6962 Special EPDM Grid Protectors
- PT70-M fluoroplastic/Special 69 Series EPDM pipe flange gaskets.
- Fluoroplastic protected Special 69 Series EPDM anode membrane cell, and chlorate cell gaskets.
- Fluoroplastic protected 6962 Special EPDM diaphragm cell anode post gaskets.

Diaphragm Cell Parts

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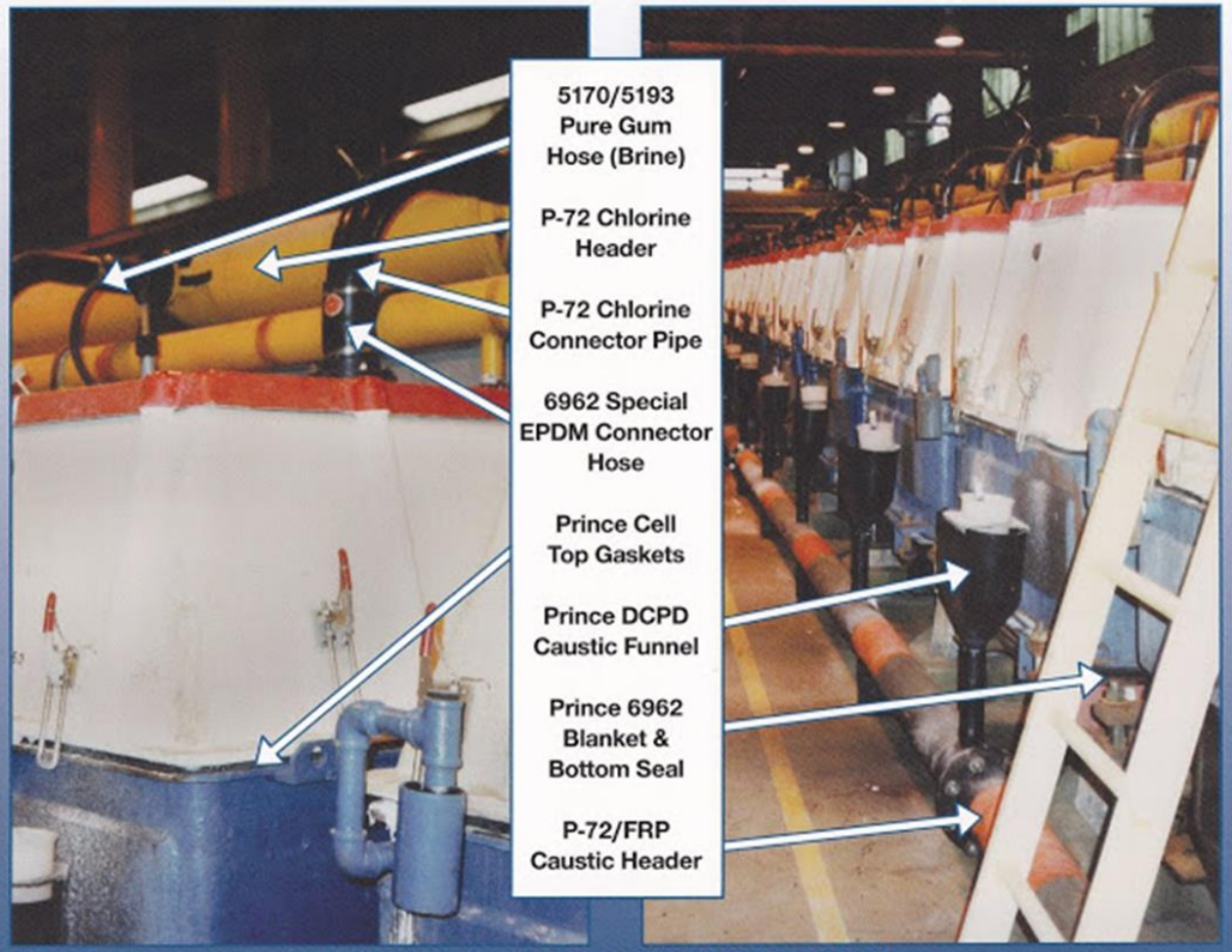
Advanced Technology in Chlor-Alkali Cell Accessory Parts

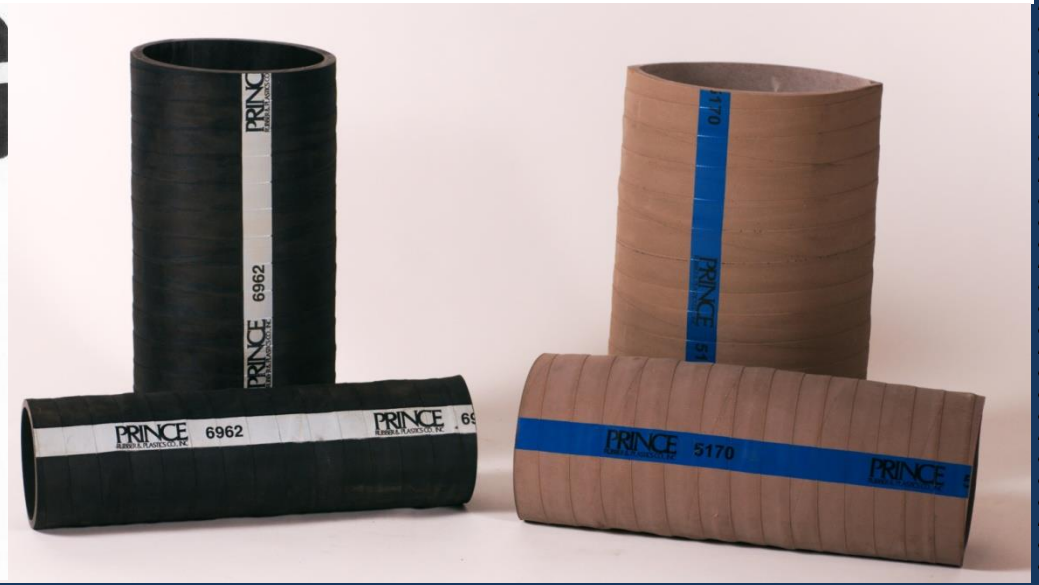
Diaphragm Cell Parts

- Grid Covers
- Cell Gasketing
- Cell Top and Bottom Seals
- Flexible Sleeve Connectors
- Bellows
- Anode Spacers
- Brine Tubing
- Cell Connector Pipes
- Rubber Stopper Gaskets
- Caustic Funnel Assemblies
- Cell Circuit Piping

Buffalo, New York · Baton Rouge, Louisiana USA
Fort Erie, Canada




PRINCE 6962


PRINCE
6962
PRINCE 6962
PRINCE 5170

Examples Plastic/Rubber Products

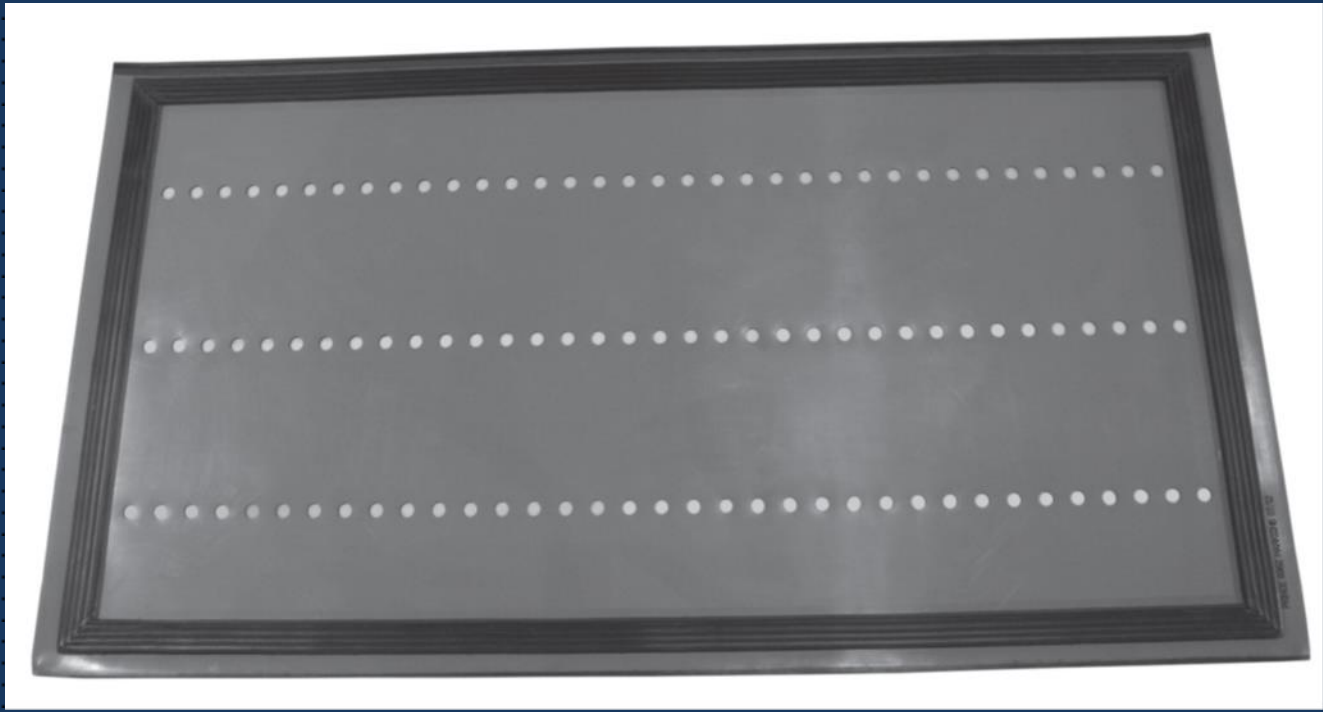
- Anode Post Gaskets

- Fluoroplastic protected 6962 Special EPDM diaphragm cell anode post gaskets.

Examples Plastic/Rubber Products

Mark III HB (hot bond)

- Fluoroplastic/Special 6962 Special EPDM Grid Protectors



Membrane Cell Parts

Replacement Frame Gaskets

Header Systems

Fluoroplastic Connecting Hoses and Hose Gaskets

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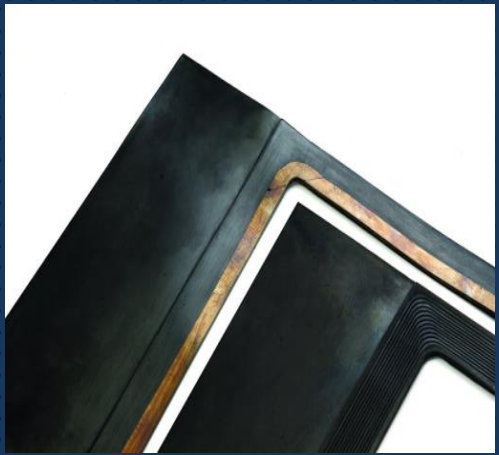
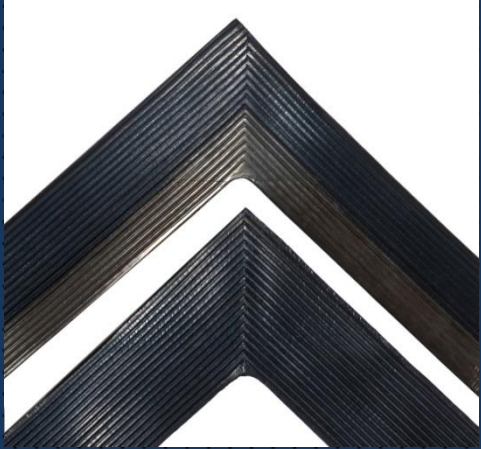
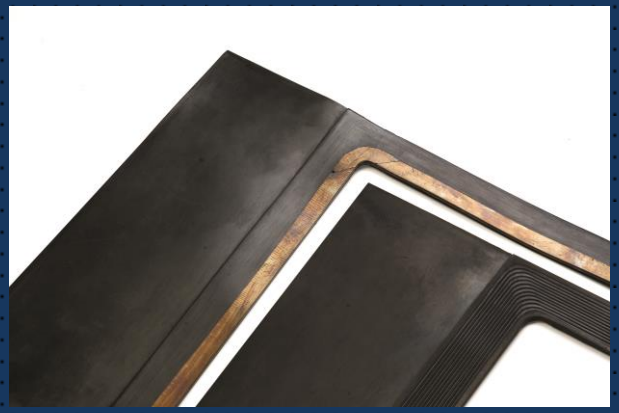
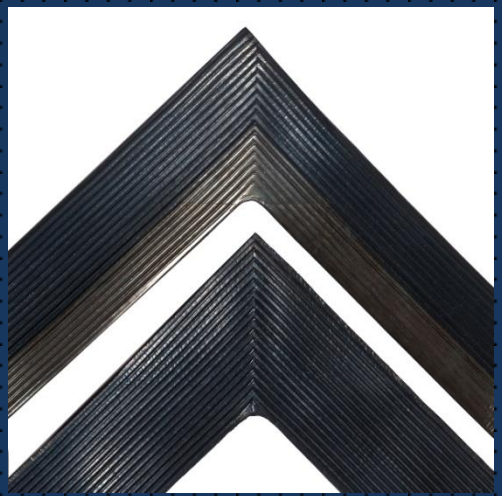
As technological advancements are made in the production of Chlorine, Prince works with chlor alkali manufactures to improve cell part life, performance and reliability.





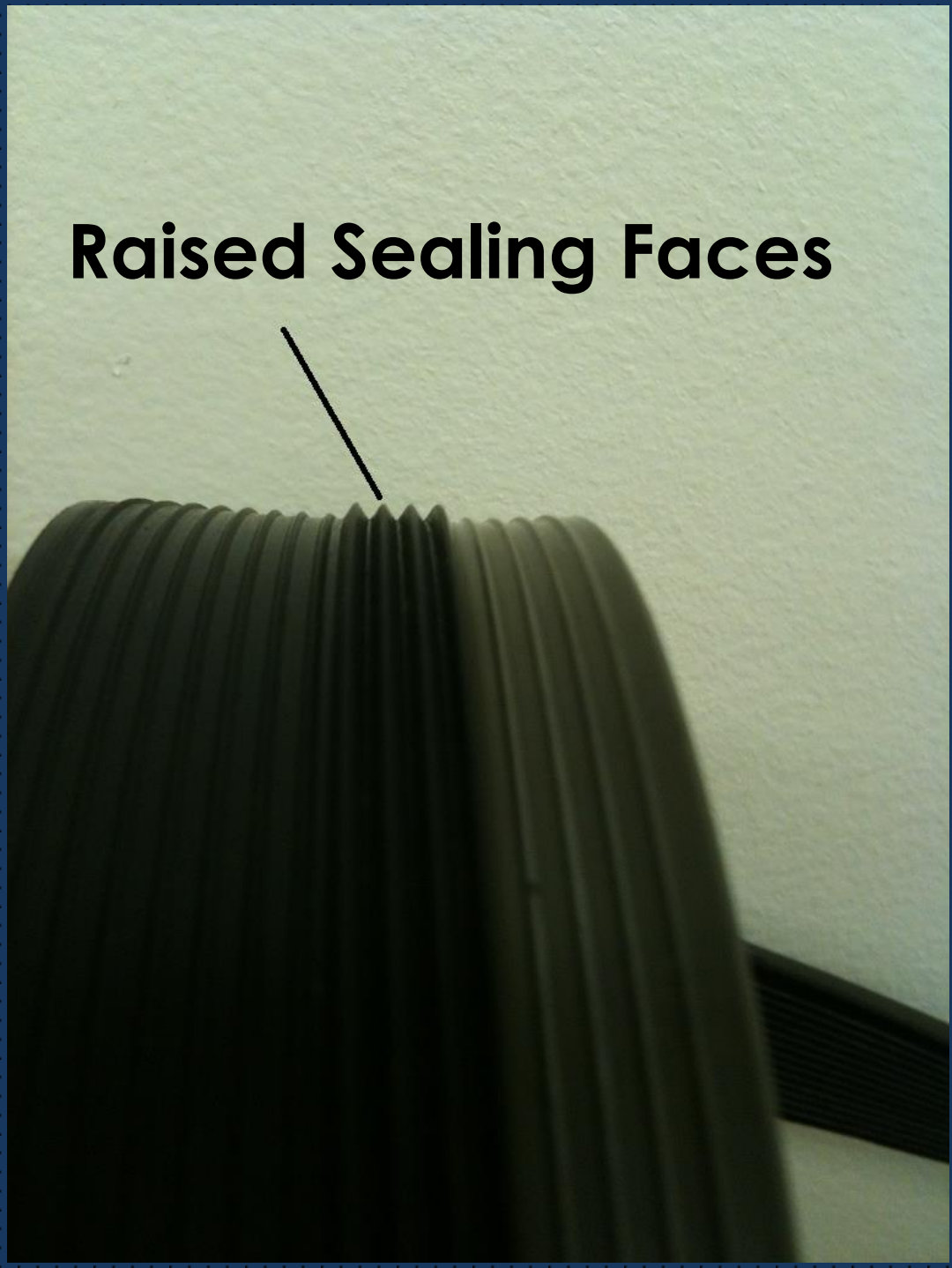
Membrane Replacement Frame Gaskets





A recent upgrade feature of this particular gasket

Raised sealing faces limit the area of contact of the gasket to the frames, thereby increasing the sealing force in this area when utilizing the same clamping force, and helping extend the seal life of the gasket.

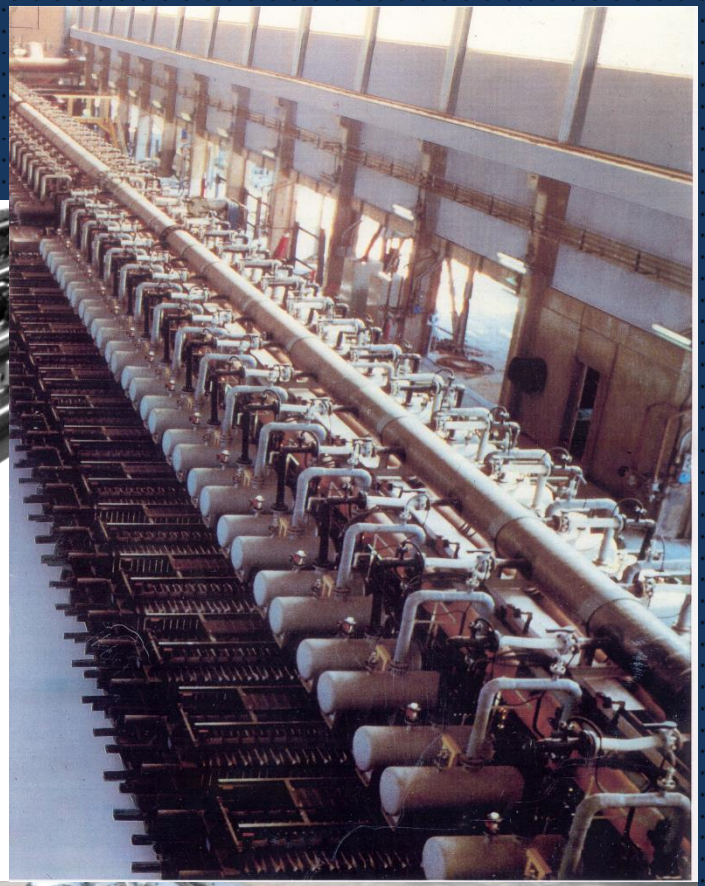


Panacea® Replacement Membrane Cell Gasket Systems Advancements

- Each Frame Gasket Type is designed specifically for that technology
- In some cases, Prince fluoroplastic armors more of the gasket than others
- Prince uses a continuous fluoroplastic armoring method
- Prince can incorporate an EPDM "Skin" over the fluoroplastic film
- Prince has improved the sealing design on certain gaskets
- Prince has improved the fastening or bonding of fluoroplastic

Prince:
Thermoformed Fluoropolymer Connector Hoses

P-72 Styrene Co-Polymer Pipe and Header Systems



PRINCE RUBBER & PLASTICS, CO., INC.
chlor-alkali products utilized in the World

Membrane Technology **Diaphragm Technology** **Mercury Technology**

Argentina Australia Belgium Brazil Canada Chile China Columbia Dominican Republic Finland France Germany Great Britain Hong Kong India Indonesia Ireland Italy Mexico Netherlands New Zealand Norway Pakistan Portugal Puerto Rico Saudi Arabia Singapore South Africa South Korea Spain Switzerland Taiwan Thailand United States Venezuela

THANK YOU FOR YOUR TIME AND ATTENTION