Parker History

1918
Arthur Parker founds the Parker Appliance Company.

1957
Parker acquires the Hannifin Company.

2007
Parker Hannifin reaches $10 Billion in Sales.
Parker Hannifin China Milestone

1982
Hubei Seal JV

1994
AP HQ in Hongkong

2002
Shenyang Rubber JV

2006
Parker China HQ

2011
Acquired Shenyang ISR

1990
1st China sales office

2000
(PASC) Seal JV

2004
Acquired Denison

2005
Acquired TJ TeJing, SSD & DH

2007
Acquired Rayco

2008
Qingdao Fluid connector

2009
Shanghai FIL, ING plant

2009
Acquired Legris

2009
Aerospace 1st China Office

2012
Wuxi Automation

2012
Wuxi Instrumentation
Execute Market Drive for key market penetration

- Mobile Construction
- Marine & Offshore
- Steel Mills
- Transportation (Rail)
- Diesel Engine
- Automotive In-Plant
- Alternative Energy (Windpower, Nuclear)
- Distribution & MRO
- Life Sciences
- Mining
Seven Product Group

- 航空
- 自动化
- 过滤
- 流体连接件
- 液压
- 仪器仪表
- 密封
Product Line
Key Facts about Parker

- $14.3 Billion in Revenue
- $400 Million in Revenue in Parker China
- 839,000 Products Sold
- 471,000 Customers
- 55,000 Employees
- 13,000 Distribution/MRO Outlets
- 1,100 Markets
- 139 Divisions
- 312 Manufacturing Plants
- 46 Countries
Parker Hannifin China

- 7 Regional Sales Offices
- 14 Manufacturing Plants
- Over 3200 Employees
- 8 Business Groups
- 1 Bonded Warehouse

[Map showing locations in China with icons for offices, plants, etc.]

- Places mentioned: Beijing, Tianjin, Shenyang, Qingdao, Shanghai, Dongguan, Shenzhen, Wuxi, Xi’an, Shenyang, Dalian, Hong Kong, Taiwan.
Parker Hannifin China Headquarter

- Regional HQ with shared services
- Parker China Sales Co Management
- China Training Center
- R&D
- China Distribution Center
Parker Hannifin China Regional Sales Offices

- 1 Sales Management HQ
- 7 Regional Sales Offices
- Over 300 Sales Engineers
Parker Hannifin China Manufacturing Plants

- **Wuxi CIC**
- **Tianjin Hydraulics PTJ**
- **Beijing Chomerics (Seals)**
- **Shenyang ISR Fluid connector**
- **Qingdao Fluid Connectors**
- **Wuxi Rayco (Seals)**
- **Wuxi Automation**
- **Wuxi Instrumentation**
- **Wuxi Legris**
- **Dongguan PASC(Seals)**
- **Shenzhen Chomerics (Seals)**
- **Shanghai Chuansha FIL**
- **Shanghai Denison (Hydraulics 2012)**
- **Parker China HQ, Shanghai**
- **Shanghai Baoshan Fluid Connector**
50,000 employees serving 500,000 customers with 1,000,000 products in almost 50 countries around the world.
Our Customers in Nuclear Power
Some of the Most Recognized Companies in the World

CONSTELLATION ENERGY
STP
ALSTOM
SOUTHERN CALIFORNIA EDISON
TVA
Hydro Québec
AREA Energy Inc.
Taiwan Power Company
TOSHIBA
Hitachi
Progress Energy
Exelon
SCE&G
Entergy
NEXCELIM
FPL
GE
Duke Energy
AREVA
PPL
Parker
# Power Generation Engineered Solutions and Systems

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<th>Aerospace Group</th>
<th>Automation Group</th>
<th>Automation Group</th>
<th>Filtration Group</th>
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</thead>
<tbody>
<tr>
<td><strong>Control Systems Division</strong>&lt;br&gt;- ABEX electrohydraulic servo valves (EHSVs)</td>
<td><strong>CTC Division</strong>&lt;br&gt;- Human machine interfaces (HMI)</td>
<td><strong>CIC Division</strong>&lt;br&gt;- Solenoid valves&lt;br&gt;- Globe valves</td>
<td><strong>Filtration and Separation Division</strong>&lt;br&gt;- Nitrogen generators&lt;br&gt;- Zero air generators&lt;br&gt;- Various gas generators&lt;br&gt;- Specialty gas filters</td>
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<tr>
<td><strong>Gas Turbine Fuel Systems Division</strong>&lt;br&gt;- Fuel nozzles (clean, check, test)&lt;br&gt;- Macrospray® nozzles&lt;br&gt;- Fogging nozzles&lt;br&gt;- Nozzle filters</td>
<td><strong>SSD Division</strong>&lt;br&gt;- Variable frequency drives (VFDs)&lt;br&gt;- Torque motors&lt;br&gt;- Black start units&lt;br&gt;- Inverters&lt;br&gt;- Adj. frequency drives (AC drive)&lt;br&gt;- Power stability grids&lt;br&gt;- Cooling systems – electric</td>
<td></td>
<td><strong>Hydraulic Filter Division</strong>&lt;br&gt;- PVS&lt;br&gt;- Icount&lt;br&gt;- Sub-micron removal (SMR)&lt;br&gt;- Hydraulic Elements&lt;br&gt;- Stationary offline system (SOS unit)&lt;br&gt;- 12S filters (HP water)&lt;br&gt;- Bottle sampler</td>
</tr>
<tr>
<td><strong>Advanced Products Divisions</strong>&lt;br&gt;- Turbine case seals&lt;br&gt;- Blade and vane seals&lt;br&gt;- Misc. metal seals</td>
<td></td>
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<td><strong>Process Advanced Filtration Division</strong>&lt;br&gt;- Water filters&lt;br&gt;- Natural gas filters&lt;br&gt;- FRLs</td>
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<tr>
<td><strong>Racor Division</strong>&lt;br&gt;- Filters&lt;br&gt;- Liquid fuel filtration&lt;br&gt;- Desalination units&lt;br&gt;- Air filtration&lt;br&gt;- GES Siloxane filter system</td>
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</tbody>
</table>
## Power Generation Engineered Solutions and Systems

<table>
<thead>
<tr>
<th>Fluid Connectors Group</th>
<th>Hydraulics Group</th>
<th>Instrumentation Group</th>
<th>Seal Group</th>
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</thead>
<tbody>
<tr>
<td><strong>Tube Fittings Division</strong>&lt;br&gt; - Fittings&lt;br&gt; - Valves</td>
<td><strong>Hydraulic Pump Division</strong>&lt;br&gt; - Pumps</td>
<td><strong>Instrumentation Products Division</strong>&lt;br&gt; - MPI™, CPI™, A-LOK® fittings&lt;br&gt; - CB check valves&lt;br&gt; - B31.1 valves&lt;br&gt; - CB series kits&lt;br&gt; - N Stamp valves&lt;br&gt; - Nuclear grade fittings&lt;br&gt; - Phastite®&lt;br&gt; - Tubing</td>
<td><strong>Engineered Polymer Systems Division</strong>&lt;br&gt; - Expansion joints&lt;br&gt; - Expansion joint repair items</td>
</tr>
<tr>
<td><strong>Quick Coupling Division</strong>&lt;br&gt; - Quick couplings&lt;br&gt; - SensoControl&lt;br&gt; - Serviceman units</td>
<td><strong>Hydraulic Valve Division</strong>&lt;br&gt; - Valves&lt;br&gt; - Electrohydraulic solenoid valves (EHSVs)&lt;br&gt; - Hand valves&lt;br&gt; - Gresen units&lt;br&gt; - HPUs</td>
<td><strong>Instrumentation Products Division Europe</strong>&lt;br&gt; - Manifolds&lt;br&gt; - Metric fittings&lt;br&gt; - Flanges&lt;br&gt; - CCIMS&lt;br&gt; - Metric valves</td>
<td><strong>Composite Sealing Systems Division</strong>&lt;br&gt; - Metal turbine case seals&lt;br&gt; - Blade and vane seals&lt;br&gt; - Misc. metal seals</td>
</tr>
<tr>
<td><strong>Energy Products Division</strong>&lt;br&gt; - Multitube® bundle&lt;br&gt; - CEMS bundle&lt;br&gt; - End termination products&lt;br&gt; - Electric trace&lt;br&gt; - Steam trace</td>
<td><strong>Hydraulic Accumulator Division</strong>&lt;br&gt; - Accumulators&lt;br&gt; - Accumulator rebuild kits&lt;br&gt; - Accumulator charging kits</td>
<td><strong>Veriflo Division</strong>&lt;br&gt; - Regulators</td>
<td><strong>Composite Sealing Systems Division</strong>&lt;br&gt; - Metal turbine case seals&lt;br&gt; - Blade and vane seals&lt;br&gt; - Misc. metal seals</td>
</tr>
<tr>
<td><strong>Hose Products Division</strong>&lt;br&gt; - Hoses&lt;br&gt; - Hose assemblies</td>
<td><strong>Hydraulic Cylinder Division</strong>&lt;br&gt; - Cylinders&lt;br&gt; - Cylinder rebuild kits</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Industrial Hose Division</strong>&lt;br&gt; - CERGOM hose</td>
<td></td>
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</tbody>
</table>
Cylinders
- Miller acquired in 1999

Turbine Controls - Hyd/EH Valve Actuation (with cylinders)
Steam Control Cylinders

- Used in large GE steam turbines
  - Steam control valve cylinder
  - Fossil fuel-generated and nuclear-generated steam
- 5” to 10” bore sizes, similar design for all bores
  - All are prepared for LVDT
- Sales since 1965
  - Parker and Miller brands
  - Mostly MRO at this point
  - (Re)starting OEM focus
OEM/MRO - Hydraulic Snubbers

- Anvil Engineered Pipe Supports supplies pipe supports, hydraulic snubbers and hydraulic snubber fluid (including Nuclear Power Plant applications)

- Cylinders used as hydraulic snubbers in pipe hanging solutions

- Mostly Miller brand
MRO – Power Plants (OPPD)

- Supplying spare parts and service kits for existing cylinders
  - Pneumatic and hydraulic
  - Valve actuators
- Updating cylinders to become more easily serviceable
- Cylinder serial number is best information to identify exact replacement parts.
MRO – Power Plants (APS)

• Power Plant MRO opportunities
  • Example: Arizona Public Service (APS)

• 20” Bore, Double Rod, Pneumatic Valve Actuator with Manual Override

• Material Certifications and Traceability for all parts
Electro Hydraulic Servo Valves
- ABEX acquired in 1996

Power Generation Solutions with Aerospace Technology

- Power Gen / Nuclear Applications
  - Hydraulic System
  - Fuel System
  - Engine controls
## The Parker JetPipe® (ABEX) Advantage vs Moog Flapper Nozzle

<table>
<thead>
<tr>
<th>Design/Performance Characteristic</th>
<th>Parker JetPipe</th>
<th>Deflector-Jet</th>
<th>Flapper Nozzle</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Stage Orifice Size</td>
<td>Relatively large</td>
<td>Relatively large</td>
<td>Very small</td>
</tr>
<tr>
<td>Contamination Sensitivity</td>
<td>More tolerant</td>
<td>More tolerant</td>
<td>Very sensitive</td>
</tr>
<tr>
<td>Potential for “noisy” operation</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Failure mode (plugged orifice)</td>
<td>Passive</td>
<td>Passive</td>
<td>Hard over</td>
</tr>
<tr>
<td>First stage pressure recovery, pressure gain, flow recovery</td>
<td>Jet-Pipe and deflector-jet are more than twice that of the flapper nozzle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low temperature performance</td>
<td>Good</td>
<td>Inferior</td>
<td>Good at lower pressures</td>
</tr>
<tr>
<td>First stage pressure feedback</td>
<td>None</td>
<td>None</td>
<td>Present causing instability</td>
</tr>
<tr>
<td>Sensitivity to first stage erosion</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Parker two-stage jet pipe EHSV basic design has been continuously developed and refined over the last 40 years. A high degree of confidence has been achieved with regard to those factors which affect reliability and performance over long periods under severe environmental conditions.
Parker Jet-Pipe® Servovalve

Functional Schematic

• First Stage Pressure Differential Results in Spool Translation
• Feedback Spring “Pulls” the Projector Jet Back Over Receiver
• Torque Balance is Restored and Spool Stops in New Position
• LVDT Differential Output is Proportional to Spool Position
Hydraulic Pumps & Motors
- Denison acquired in 2004

Able to provide many hydraulic actuators in a nuclear facility
H Pak Power Unit (Stainless Steel)

- Powers Parker hydraulic motor to operate air lock door
- Shin-Kori Facility (South Korea)
- PVP pump used for compatibility with ISO 46 water/glycol fluid
- Sound level less than 85 dBA
- SS electric motor, tubing, bell-housing, sight glass, etc
Denison Legacy in Nuclear

• We have supplied legacy 500 series pumps to some of the Nuclear facilities in Japan.

• These pumps were selected based on the high value of Mean Time Between Failures (MTBF).

• These pumps can function as a pump or a motor with a change of the port plate timing. The fluid used was Fyrquel.
Hydraulic Pump Division Products

Piston Pumps

- PAVC
- PVP
- P1/PD (Denison)
- PV+ *
- P2/P3
- Premier (Denison)

Hydrostatic Transmissions

- Gold Cup (Denison)

Vane Pumps (Denison) *

Radial Motors *

Calzoni

Bent Axis Pumps & Motors *

Power Unit Systems
• Turbine starter
Accumulator
- Greer acquired in 1995

- GAD solves customer hydraulic system challenges.
- GAD adds value beyond hardware alone.
- GAD process distinguishes Parker from me-too hardware

ENGINEERING YOUR SUCCESS.
Bladder Accumulators

Nuclear Applications

- Valve Actuation System
- HYD Lube Oil System
- Boric Acid Injection Skids

pulsation dampening, suction stabilizers
KleenVents (Greer Legacy Brand)

• Contamination
  • Constant airflow through the reservoir filler breather introduces a continuous supply of contamination into the system fluid

• Ambient Air
  • Airborne debris (dirt, dust, etc) can enter system through reservoir breather

• Water
  • Humidity in the ambient air can condense as water within reservoir

KleenVents - Reservoir Isolation

• Sealed reservoir
• No new contaminants can be introduced into system
• Fluid and filter lasts longer, saves money
MSIV Actuator – Parker Components

- Actuator at Exelon plant
  - Parker accumulators (gas storage)
  - Parker/Republic hydraulic control valves
  - Parker hydraulic pressure switches
Solenoid Valves
- Skinner acquired in 1997

The Most Complete Family of Process & Valves Actuation Products

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Nuclear Power Market Strategy

Significant product portfolio

- 2,3,4-way products,
- actuation valves, angle valves,
- Sinclair Collins,
- ATEX products,
- IS and Hazardous products.
- Skinner
- Sporlan

Power Gen Applications

- Hydraulics
- Pneumatics
- Electromechanical
- Instrumentation
- Filtration
- Sealing
- Fuel & fog nozzles
- Fuel delivery
- Emission controls
What is the application?

Pneumatic actuators are controlled by solenoid valves.

Process valves are controlled by actuators.

Process valves control the flow of the liquids or gases.
Wide Variety of 3-way & 4-way pilot valves
Filtration

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Filtration Application in Nuclear Power

Liquid Filtration

• Make-up oil for steam generation system ➢ MF Portable Cart (HFD)

• Gas Turbine
  - Liquid Fuel Filter ➢ Flo-Pac Pleated Cartridge (PFD)
  - Flushing of Lube Oil Syst. ➢ IL8 (HFD)

• Steam Turbine
  - Cooling Water ➢ Honeycomb TM HFT Cartridge (PFD)

• Gas Cooled Reactors
  - Inert Gas Circulating System ➢ Nitrogen Generator (Balston Div)
Filtration Application in Nuclear Power

- **EHC/MHC fluid treatment**
  - EHC/MHC Speed Control

- **Condensate Systems**
  - Condensate Polishing (Demineralizer)

- **Boiler Feed Water Pumps**
  - MHC Hydraulic Controls

**Special Nuclear Power Applications**

- **Fuel pool**
  - Spent fuel pool skimmer filter
  - Spent fuel pool heat exchanger filter
  - Spent fuel pool demineralizer filter

**Series and Models**

- CN Series (HFD)
- Fulflo Poly-Mate, MBC Series Cartridge (PFD)
- IL8 Series (HFD)
- MBC Series Cartridge (PFD)
SMR
- Balanced Charge Agglomeration

SMR2 & SMR10 Series
Submicronic Removal-Fluid Purification Systems

Customer Value Proposition:
The SMR Series is the smart purification solution for fluid flows in the 120-400 GPM (454 to 1518 LPH) range. The SMR Series combines patented Balanced Charge Agglomeration (BQA™) technology, which maintains hydraulic and lubricating fluids in optimum condition and prevents the build-up of sludge and varnish. The SMR Series is available in PLC or amplified control versions.

Contact Information:
Parker Hannifin Corporation
Hydraulic Filter Division
16910 Eton County Road #2
Mesasia, OH 44241 USA
phone 800 323 1258
fax 440 644 8285
hydraulicfilter@parker.com
www.parker.com/hydraulicfilter

Product Features:
- Contaminant removal to the sub-micron level
- Prevention and removal of sludge and varnish
- Removal of oxide insolutes and biological contamination
- Removal of ferrous and non-ferrous contamination
- Highest flow rates in the industry
- Extends the usable life of fluid
Mechanical Filtration

- Ineffective for small particles - mostly remove > 3 micron
- Ineffective for soft particles and precursors of varnish
- Do not remove varnish, with high efficiency filter and excessive pressure, actually creates more varnish.
How the Technology Works: “Balanced Charge Agglomeration™” (BCA)

1. Particles are passed across high-voltage electrodes, inducing a charge on the particles (+) and (-) in separate paths.

2. Oppositely charged particles are mixed and are attracted to each other, forming larger particle clusters.

3. Particle clusters are more efficiently filtered or removed by centrifugal separators.
A New and Modern Solution

Turbine OEM and Industrial Experts recommend Electric Charge Technology filtration systems.

There are two electric charge technology systems:

- **EP Technology**
  Electrostatic Precipitation Technology

- **BCA™ Technology**
  Balanced Charge Agglomeration Technology
Agglomerated particles from the collection filter media at Prairie Island Nuclear power plant magnified at 500 X
GT1 - Samples From BCA Unit and Lube Tank

**Maximum Color Differential - 89**
Full Patch - After BCA Unit

**100 X - Largest Agglomeration**
After BCA Unit

**400X - Largest Agglomeration**
After BCA Unit

**Maximum Color Differential - 55**
Full Patch - From Lube Tank

**100X - Largest Agglomeration**
From Lube Tank

**400 X - Largest Agglomeration**
From Lube Tank
Water Removal

• BCA technology does not remove water, however…
• Removal of thousands of sub-micron particles eliminates the majority of sites where water can readily attach.
• Water more easily separated & removed
• Improved Demulsibility
The Parker BCA Benefit

- Unmatched fluid purification & system cleaning capacity
- Proven Varnish Removal
- PLC control & data tracking
- GE approved technology
- Flexible pricing, delivery & payment terms
- Extended warranty available
System Sizing

- Recommend minimum reservoir turnover of 2X to 3X per day.
  - SMR2 up to 1800 gallon reservoir
  - SMR10 up to 7200 gallon reservoir
A Representative List of Clients

- FP and L
- Reliant
- LA Power and Water
- Dominion
- Mekong Energy
- Iberdola
- Oxy Chemical
- Con Ed
- Dubai Aluminum
- BOC Gas
- Arizona Public Service
- NAES
- Westar
- Aramco
- CMS Energy
- Prairie Island Nuclear Power
- TECO
- Wheelabrator
- Malaysia LNG
- Qatar LNG
- Tucson Electric

- Pfizer
- Yale University
- U of Iowa
- TVA
- Keyspan
- WBOR
- Kimberly Clark
- Alpac
- International Paper
- Shanghai Power
- Scott Paper
- Exxon Mobil
- Eaton
- Pemex
- Vero Beach Muni Power
- Italian Coast Guard
- AEP
- Pakistan Petroleum
- Samut Prakan Power
- Refines Sugar
- Alcoa
Water Filtration

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Power Gen Products

- Feed water to boilers
- Nuclear and Fossil Power Plants,
- Cogeneration, Gas Turbines
- Water Processing:
  - Reverse Osmosis,
  - Centralized Water Systems,
  - Process Water,
- Reverse Osmosis
- Process Waste Water
- Nox water
- Fogging Filtration
Used Cartridges

Parmax® Vessel
Brackish Water Units

Reverse Osmosis Units
Wound Depth Filters
Staple Fiber Yarns

APPLICATIONS:

Bulk Chemicals
Process Water
Parker Fulflo® MegaBond™ Plus Melt Blown

- Polypropylene depth media
  - Excellent gel removal
  - Excellent solvent compatibility
- Absolute micron ratings
  - Reliable, consistent filtration
Parker DuraBond™

- Rigid, depth media
  - Withstands high pressure
  - Excellent gel removal
- “Classifying” cartridge
  - Does not remove pigments/oxides
- FDA grade materials
  - Acceptable for food grade coatings
- Non-fiber releasing
  - Choice for automotive paint and enamels
Single Cartridge Housings

- Stainless Steel
- Carbon Steel
- Polypropylene
- PFA
- Flat Gasket Sealing
- Double O-Ring Sealing
- Some Up to 30 GPM
Multiple Cartridge Housings
Hydraulic Filtration

ENGINEERING YOUR SUCCESS.
Power Generation Market

Steam Turbine Driven - Generation
- Fossil Fuel - Coal, Oil
- Nuclear
- Other - Wood chip, trash, etc

Hydro Driven – Generation
- Dams

Gas Turbine Driven - Generation
- Turbine powered (jet engine)

Co-Generation (Combined Cycle)

Wind – Generation.
Applications
Applications
Full Filter Product Line

- Low Pressure Filters
- Medium Pressure Filters
- High Pressure Filters
- Off-line Systems
- Full Condition Monitoring Product Offering
The Steam Turbine Problems / Effect / Solution

- **Steam & Gas Turbine Lube Oil**
  - Problem - Particulate buildup & Water ingressions.
  - **Effect** - Bearing wear, Loss of fluid life.
  - **Solution** - Maintaining desired ISO.
    - Hydraulic Filters
      - IL8 & 718 housings & elements (glass media)
    - Water Monitoring and Removal
      - MS100 Moisture Indicator
      - PVS Purifier
      - Kidney filter units.
Typical Lube System

- Tank
- Pump(s)
- Filters
- Cooler
- To Bearings
  Generally Low Pressure eg 100 psi
- Gravity Return
Turbine EHC Problems / Effect / Solution

• Turbine EHC Systems (Electro Hyd. Control)
  ▪ Problem - Particulate build up from Wear & Ingression
    Chemical synthetic fluid changes.
  ▪ Effect - Poor valve reaction = improper speed (Hz) control, loss of efficiency.
  ▪ Solution - Maintaining desired ISO, Servo valve protection, fluid chemical balance (acid PH).

• On - Hydraulic Power Units
  • 15/30P, 50P, Return Line Filters
  • Condition Monitoring Products
  • PVS Dehydration unit

• Steam & Guide Vane Control Servo Valves
  • 15P, 30P, 50P, Duplexes 30PD, MPD.
HFD Products - Typical Hydraulic Power Unit

- **Pump**
- **Return Filter**
  - Catch returning dirt
- **Valving**
- **To work**
- **Off line Filter**
  - Additional Protection
- **Pressure Filter**
  - Protect the components
- **Accessories**
- **Tank**
  - Dirt settle & cooling
- **Suction Strainer**
  - Protect the pump
- **Breather**
  - Stop airborne dirt & water

Additional Protection to work efficiently.
The Generator Problems / Effect / Solution

• Generator Seal Lube oil
  ▪ Problem - Particulate build up.
  ▪ Effect - Seal & Bearing wear.
  • Hydrogen gas loss
  • Water ingestion
  ▪ Solution - Maintain desired ISO.
  • Seal Oil filter
    ✓ 15P, 30PD duplex
  • Water Monitoring & Removal
    ✓ MS100 Moister Indicator
    ✓ PVS Purifier.
Turbine (Jet) Driven Problems / Effect / Solution

- Air Inlet Section
- Gas Jet Turbine (lube oil skid)
  - Problem - Lube oil contamination
  - Effect - Shorten Turbine life
  - Solution -
    - 718 & IL8 filters
- Generator Section
  - Seal & Lube oil filtration.
Power Transmission Problems / Effect / Solution

• Power Transmission
  ▪ Problem - Dirty Transformer and Load Tap Changer oil, Loss of Dielectric strength.
  ▪ Effect - Trans. heat build up, Efficiency loss, in field failures.
  ▪ Solution - Maintain Trans. Oil ISO.
    • On board filtration
    • Truck mounted transfer filtration
    • Service depot filtration
    • Load Tap Changer (LTC) filter units
    • PVS, Carts.
Par-Test

- Laboratory analysis
- Particle count, spectrometric, viscosity, water content, photo, neutralization
- 2-3 day turnaround
- Buy service w/ bottle
Reservoir Accessories

- Suction Strainers
- Filler Breathers
- Diffusers
- Temperature / Level Gauges
ICount
Particle Detector

Particle Counting Technology
On-Line Filtration
Off-Line Filtration
Condition Monitoring Solutions
O-ring

Radiation Resistant O-ring

- Nuclear Application (-70 to 250 deg F)
  - Storage Containers
  - High/Low Temp Cooling Connections
  - Steam Turbine & Boiler
E0740 EPDM High Radiation O-ring

Features and Benefits

• Standard sizes – speed to customer
• Custom spliced O-rings for extreme large IDs
• Test data with popular gearbox lubricants
• Long term CSR data
• Adhesives for holding large seals in place
• NUPIC certification for Nuclear Power Plants
• Several unique recipes specifically for power plant applications
• Name Recognition - Parker has been the premier supplier of O-rings for USA power plants for over 30 years

• High Radiation (Nuclear Power)
  E0740 is specially formulated for comp set resistance at intensities of $10^6$ rads and above

• US Nuclear Installed Base
  Calvert Cliffs  Point Beach
  Ginna            Savannah River
  Nine Mile Point  Tennessee Valley
  Monticello
核工业技术

防辐射

应用在辐射环境中的O形圈最重要的一个性能是其压缩形变率。当密封件暴露在γ射线中时，其压缩形变率受到的影响最严重。必须在辐射环境中使用的复合橡胶必须通过严格的性能及材料测试。另外，橡胶材料必须与工作环境（包括温度，压力，等等）及介质兼容。而水和水蒸汽是核工业应用中非常常用的介质。

这会使得系统泄漏的可能性大大提高。
Parker开发了几款防辐射等级达到了10^7 rad的材料。这些材料的使用寿命更长，这就大大减少了维修时间。详见下表。

一般情况下，核工业的工况为：

温度: 180°C
辐射度: 10^7 rad

在大多数工况中，辐射量等级都保持在10^6 rad以下。稳定工作几年后通常都能达到，当辐射等级为10^6 rad时，几乎所有的橡胶的性能都不会发生变化，但当辐射等级达到10^7 rad时，橡胶的压缩形变率会发生很大的变化，
中国成功案例

秦山核电站。

大亚湾核电站

KSB核电泵阀厂

孟买，印度

成功案例介绍

应用:
静密封用O形圈
介质：最高温度为85℃的Nalcool-2000制冷剂

问题:
一个为发电厂、海上平台及船舶等生产大型发动机的客户遇到了一个密封问题，他们原来在用的氟橡胶O形圈的使用寿命太低。他找到Parker希望找到一种能使用3000小时的密封材料。

Parker解决方案:
经过仔细研究，Parker推荐了E0740-75。经测试后发现E0740-75的使用寿命比前使用的氟橡胶长很多。

结果:
客户使用了Parker的E0740-75这款材料，他们在这一应用中再也没有发现任何问题。
Instrumentation Valves
Certificates and Approvals

ISO 9001:2000
NQA-1
ASME N Stamp
ASME QSC (NCA-3800)
NUPIC Approval
10 CFR 50 Appendix B Program
Compliant to RCC-M
Commercial Grade Dedication
Globe Valves

Union Bonnet and Needle Valves
Bellows Valves

Nuclear and Commercial Applications

The Parker Bellows Valves are capable of meeting ASME BPVC requirements.

• Section III, Class 1 and 2 valves

The Parker Bellows Valves provide high integrity atmospheric sealing for severe service instrumentation applications.

• Welded or gasketed valve body to bellows sealing
• Choice of Grafoil® or PTFE packing
• Choice of blunt, regulating or soft stem tip configurations
• 316 stainless steel construction
• Wide variety of US Customary and SI ports
• Panel Mountable
• 100% factory tested
• **Ball Valves**
  • B series
  • MB series
  • SWB series
  • HB series
  • MPB series

• **Plug Valves**
  • PR series
• **Needle Valves**
  - V series
  - NP series
  - SN series
  - VQ series
  - U series
  - MPN series

• **Metering Valves**
  - NS series
  - NM series
  - NL series
  - HR series
- **Check Valves**
  - C series
  - CO series
  - LC series
  - CB series
  - MPC series

- **Filters**
  - F series
  - FT series
  - MPF series

- **Relief Valves**
  - RL series
  - RH series
  - MPR series
  - BV series
  - PG series
Thermowells

Purpose:
- Protect the sensor
- Provide isolation from the process for on-line sensor change-out
Thermowells

Styles:
- Threaded
- Flanged
- VanStone
- Socket Weld
- Weld-in
- Sanitary
- Protection Tubes
- Sample Probes
- Other
Slip-fit intra-fitting connectors

Same screw size throughout

Same plane flowpaths

Field connectors (top or end)

Mounting “Pegboard”

Slip-fit intra-fitting connectors

IntraFlow Modular Systems
Manifolds
CCIMS Close Coupling Mounting Solution

Customer concerns....

- Alignment of Flanges
- Number of components required
- Time for installation
- Measurement inaccuracies

An integrated manifold solution offers a precise, high-performance flow measurement and a quick disconnect replacement alternative reducing exposure to radiation.
CCIMS Delivers

- Reduced installation costs
- Reduced cost of ownership
- Reduced weight and space
- Reduced components
- Reduced connection/leak paths
- Improved measurement accuracy
- Improved safety

Product range

- CCIMS available in 316 SS. Exotic material versions will be available to special order
CPI™ / A-LOK® Fittings

ENGINEERING YOUR SUCCESS.
Instrumentation Fittings:

- 3 piece design
- 316 SS, Carbon Steel, Brass
Instrumentation Fittings:

- 4 piece design (twin ferrule)
- 316 SS, Carbon Steel, Brass
CPI™ Tube Fittings

- CPI™ Works well in all instrumentation systems
- CPI™ Simpler to install
- CPI™ Easier to troubleshoot
- CPI™ Better visibility with black nut

A-LOK® Tube Fittings

- A-LOK® works well in all instrumentation settings
- A-LOK® is a two ferrule design
- A-LOK® meets two ferrule specifications
Parker Hannifin Instrument Tubing

Seamless Stainless Steel tubes for Hydraulic and Instrumentation Systems

Looking to complete your tube fittings system?

When you want to reduce the risk of leakage in your hydraulic and instrumentation system, consider Parker seamless stainless steel, straight-length tubing.

Product Features:

- Weldability
- Plugged Ends
- Superior OD Finish
- Strictly controlled ovality, eccentricity and close tolerances
- Made under high quality standards
- Parker "Branded" on tubing

Product Benefits:

- Controlled and consistent quality of steel grades provides easy welding
- Protection during transit and inside contamination
- Ensures no leakage when connecting straight tubes with Parker Fittings
- Superior performance in a wide variety of system applications, temperatures and pressures
- Meets current industry requirements for tubing

Contact Information:

Parker Hannifin Corporation
Instrumentation Products Division
1005A Greiner Way
Huntsville, AL 35806

Phone 256.881.2640
Fax 256.881.5730
ipd.sales@parker.com

www.parker.com/ipdus

ENGINEERING YOUR SUCCESS.
Phastite - How It Works

Prepare and insert tubing into connector
Phastite - How It Works

Insert tubing and connector into the tool
Phastite - How It Works

Operate the chosen pump until the collars touch the body shoulder
Phastite - How It Works

Once the collars achieve the metal to metal contact the connector is fully assembled
Phastite - How It Works

Assembly sequence: start of the process:
As collar slides it starts to drive the profiles onto the surface:
Hinge point comes into action:
Phastite - How It Works

As the body nose hinges down a series of formed rings create compressive seals and grips onto the surface of the tubing.
Phastite - Available for Tubing & Piping

To suit Tube Sizes
• Metric 6, 8, 10, 12, 14, 16, 18, 20, 22, & 25mm
• Fractional ¼, 3/8, ½, 5/8, ¾, 7/8, & 1”
• Wall thickness: 0.5mm (0.020”) to 4.8mm (0.188”)

To suit Pipe Sizes
• Piping Phastite (3/4”, 1”, 1 ½”, 2” ) supported by Parker Fluid Connectors Group

Materials
• 316 stainless steel

Configurations
• Union straights, elbows, tees and crosses
• Termination fittings, male studs to BSPT and NPT
• Termination fittings, female studs to BSPT and NPT
Why Phastite?

½ to 1 hour per pass x 6

15 Minutes for entire installation

- For Stainless Steel Pipe, 304/316/316L SS
- Pipe tolerance control built into fitting
  - Pipe tolerances to ASTM A312
- No installation/assembly gaging required
- Fully HCT
- 1” and 1 ½” initial launch product
- DNV testing to start in early FY-12

No subsequent testing required!
Why Phastite?

• Throughput and Efficiency:
  • Specifically where multi-pass pipe welding is a process bottleneck (1/2 hr per pass of welding time)
  • Complements most welded piping systems (not replace)
  • Improves the efficiency of welder
    • Will not replace all welding in system
    • Improves overall speed of installation
    • Enables welders to focus efforts to boiler, pressure vessel, larger piping, structural work, etc
  • Eliminates inspection such as LDP & X-Ray

• Lower Level Value Drivers:
  • Safety
  • Cleanliness
  • Flushing/Pickle-Passivate
  • Downtime reduction for repair application
  • Reduction in welding consumables
Flexible Metal Hose
When to Use Metal Hose?

Temperature Extremes (Media or Ambient)
- Maximum Temperature of 1500° F Intermittent, 1200° F continuous

Chemical Compatibility (Media or Ambient)
- 100% SS Construction

Permeation Concerns
- Can be Considered Zero Permeation Product

Vacuum
- Construction Maintained Under Full Vacuum
- Other Hoses May Collapse or Require Internal Spring Guard

Leak-free Connection
- Metal Hose Often Used as Conduit to Shield Wires or Other Hoses
Product Selection

Size

• 1/4” up to 12”
  • Contact Parflex for Availability of Products over 2”
  • 9H Metal Hose Only Available in Sizes up to 1 1/2”

Temperature

• Cryogenic (-380° F) to 1200° F
  • Intermittent Maximum Temperature of 1500° F with 316SS Braid
  • Maximum Temperature of 900° F with Standard 304SS Braid
  • Temperature Range Limited to -70° F to 500° F for Carbon Steel Fittings

Media

• Excellent Chemical Resistance
  • 100% SS Construction
  • Corrosion Resistance Charts ( pgs. 10-11)
• Zero Permeation
Product Selection

Pressure

- Full Vacuum (30in/Hg) to 5800 psi
  - Pressure De-rating Factors
    - Elevated Temperatures (pg. 9)
    - Pulsating Pressures (.50 De-rating)
    - Pressure Spikes (.17 De-rating)
  - Pressure Drop
    - Compared to Rigid Pipe, Always a Greater Pressure Drop with Corrugated Metal Hose

End Fittings

- Industrial
  - Pipe Thread, JIC, Universal Tube Stub, ORFS
- Instrumentation
  - A-Lok®, VacuSeal™, CPI™, UltraSeal™
- Flange (150lb and 300lb)
  - Raised Face Weld Neck, Schedule 40 Type A, Raised Face Slip-on

<table>
<thead>
<tr>
<th>Temperature °F</th>
<th>Working Pressure T321/316L</th>
<th>Derating Factor T304</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>150</td>
<td>.97</td>
<td>.96</td>
</tr>
<tr>
<td>200</td>
<td>.94</td>
<td>.92</td>
</tr>
<tr>
<td>250</td>
<td>.92</td>
<td>.91</td>
</tr>
<tr>
<td>300</td>
<td>.88</td>
<td>.86</td>
</tr>
<tr>
<td>350</td>
<td>.85</td>
<td>.85</td>
</tr>
<tr>
<td>400</td>
<td>.83</td>
<td>.82</td>
</tr>
<tr>
<td>450</td>
<td>.81</td>
<td>.80</td>
</tr>
<tr>
<td>500</td>
<td>.78</td>
<td>.77</td>
</tr>
<tr>
<td>600</td>
<td>.74</td>
<td>.73</td>
</tr>
<tr>
<td>700</td>
<td>.70</td>
<td>.69</td>
</tr>
<tr>
<td>800</td>
<td>.66</td>
<td>.64</td>
</tr>
<tr>
<td>900</td>
<td>.62</td>
<td>.58</td>
</tr>
<tr>
<td>1000</td>
<td>.60</td>
<td>.58</td>
</tr>
<tr>
<td>1100</td>
<td>.58</td>
<td>.58</td>
</tr>
<tr>
<td>1200</td>
<td>.55</td>
<td>.58</td>
</tr>
<tr>
<td>1300</td>
<td>.50</td>
<td>.50</td>
</tr>
<tr>
<td>1400</td>
<td>.44</td>
<td>.44</td>
</tr>
<tr>
<td>1500</td>
<td>.40</td>
<td>.40</td>
</tr>
</tbody>
</table>
Product Selection

9A – General purpose
- 1/4” – 12” ID
- Contact Parflex for Availability of Products over 2”
- Working Pressures up to 2700psi

9M – Flexible
- 1/4” – 12” ID
- Contact Parflex for Availability of Products over 2”
- Working Pressures up to 2700psi
- Compressed Corrugations for Increased Flexibility

9H – High Pressure
- 1/4” – 1 1/2” ID
- Working Pressures up to 5800psi
- Compressed Corrugations for Increased Flexibility
Push-Lok® & Push-Lok Plus Multipurpose Hose

ENGINEERING YOUR SUCCESS.
General Information

- What’s so special about Push-Lok hose?
  - Easy to use - no clamps, bands, clips, or wires required
- 5 Hoses make up the Push-Lok family
  - 801 – Now known as Push-Lok Plus
  - 804
  - 821
  - 821FR
  - 836 Plus
General Information

Fiber braid reinforcement layer is impregnated with synthetic rubber for added durability and longer service life.

Extruded, synthetic rubber inner tube is resistant to air, water, and petroleum-base oil.

Quick and easy assembly method without the need for clamps, bands, clips, or wires.

High-quality elastomer cover offers excellent flexibility, resistance to abrasion, and a variety of colors for line identification and preventative maintenance.
Multipurpose Hose – **PUSH-LOK Plus**

**Breakdown**

<table>
<thead>
<tr>
<th>Hose</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>801</td>
<td>General purpose Push-Lok product line</td>
</tr>
<tr>
<td>836</td>
<td>High temperature Push-Lok hose (302 °F)</td>
</tr>
<tr>
<td>821</td>
<td>Higher pressure Push-Lok with a fabric braided cover</td>
</tr>
<tr>
<td>821FR</td>
<td>Fire resistant Push-Lok with fabric cover</td>
</tr>
<tr>
<td>804</td>
<td>EPDM Push-Lok for hot water, dry air, and phosphate ester fluids</td>
</tr>
</tbody>
</table>
Quick Couplings
- Pneumatics & Hydraulics

ENGINEERING YOUR SUCCESS.
**Definition of a Quick-Coupling**

“A Quick-Coupling/Disconnect Coupling is a mechanical device that provides a fast, easy sure way to repeatedly connect and disconnect almost any fluid, gas line”.

---

**Quick Coupling Basics**

---
# Quick Coupling Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>Chromium 6 Free Plated Carbon Steel, Heat Treatments, Nickel-Plated Steel, Screw Machine Steel (12L14)</td>
</tr>
<tr>
<td>Brass</td>
<td>Plain, Nickel or Chrome Plated, Non-Magnetic, A-Metal (dezincification)</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>AISI 301, 302, 303, 304, 316L, 316Ti, 420</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Anodized Aluminum, Dural</td>
</tr>
<tr>
<td>Plastic/Thermoplastic</td>
<td>Acetal (Dupont’s Delrin), Polypropylene, Polysulfone, Polyvinyl Fluoride, Victrex (polyarylether ketone), Polyvinyl Chloride</td>
</tr>
</tbody>
</table>
# Quick Coupling Seals

<table>
<thead>
<tr>
<th>Seal Type</th>
<th>Temperature Rating</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Seal</td>
<td>n/a</td>
<td>Plug only, for one way and straight through</td>
</tr>
<tr>
<td>Buna-N/Nitrile</td>
<td>From –60°F up to 255°F</td>
<td>Standard seals</td>
</tr>
<tr>
<td></td>
<td>From -51°C up to 124°C</td>
<td></td>
</tr>
<tr>
<td>Fluorocarbon (Viton)</td>
<td>From 25-30°F up to 480°F</td>
<td>Freon 12, 22, 134 A, ISO-Butane, wide variety</td>
</tr>
<tr>
<td></td>
<td>From -4 up to</td>
<td></td>
</tr>
<tr>
<td>EPDM</td>
<td>From -60°F up to 330°F</td>
<td>Not for mineral based greases or oils Steam</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTFE (Teflon)</td>
<td>From -100°F up to 450°F</td>
<td>Cryogenic applications, very resistant but difficult to connect and disconnect</td>
</tr>
<tr>
<td>Neoprene</td>
<td>From -60°F up to 240°F</td>
<td>Ozone, Oxygen, some “old type” Freon</td>
</tr>
<tr>
<td>Butyl</td>
<td>From -40°F up to 250°F</td>
<td>Skydrol, chemicals</td>
</tr>
<tr>
<td>Perfluoroelastomer</td>
<td>From 10°F up to 580°F</td>
<td>High temp and Chemical resistance “Perfluor Elastomers”</td>
</tr>
<tr>
<td>(Kalrez)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# 60 Series

## Product Specs

<table>
<thead>
<tr>
<th>Specifications</th>
<th>ISO 7241 Series B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Size</td>
<td>⅛”, ¼”, ⅜”, ½”, ¾”, 1”, 1½”, 2½”</td>
</tr>
<tr>
<td>Rated Pressure</td>
<td>800 psi to 5000 psi (55 bar to 344 bar)</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-40°F - 500°F</td>
</tr>
<tr>
<td></td>
<td>-40°C - 260°C</td>
</tr>
<tr>
<td>Ports</td>
<td>NPTF, ORB, BSPP</td>
</tr>
<tr>
<td>Body Material</td>
<td>Steel, Brass, 303 &amp; 316 Stainless Steel</td>
</tr>
<tr>
<td>Standard Seal</td>
<td>Steel Couplers - Nitrile w/ Perflouromer, Back up Washer, Brass Couplers - Double Nitrile O-ring</td>
</tr>
</tbody>
</table>
60 Series Features

Nipple Body

Locking Balls

Sleeve

Coupler Body

Perch

O-ring (valve seal)

Back-up Ring

O-ring (interface seal)
Snap-Tite H series Quick Disconnect
- General Purpose Poppet Coupling

Features
- Construction - Available in brass, aluminum, plated steel and 316 stainless steel
- Sizes - 1/8" thru 4"
- Seal Versatility - Wide choice of standard and special seal materials for a wide variety of media
- Positive Sealing when Connected - Two sealing methods available based on application parameters
- Dependable Operation - Ball locking mechanism for positive connection
- Low Pressure Drop - Valve design and positive valve positioning maintain clean linear flow
- Valve Configurations - Available with double or single shut-off valving or straight through
- Pressure Ratings - For use in working pressures to 11,000 psi (759 bar)
- End Fitting Versatility - Two piece body construction allows for many end fitting options
Triple-Lok 37 ° Flare Fittings

- ASME B31.1 Code for Power Piping
Design Features

Components - 3 piece design

- Tube Nut
- Flared Tube
- Body
- Tube Sleeve
Design Features

Sealing

• Fitting nose at 37°
• Tube is flared to 37°
• Single seal point between fitting nose and flared tube
• Proper clamp load is required to maintain seal
Design Features

Versatility - Usable with tubing and hose

Adaptable to Inch Tubing

Adaptable to Metric Tubing

Adaptable to Hose Assembly
Design Features

- Recommended for thin to medium wall tubing
  - Maximum wall limitation
- Standard in steel, stainless steel, brass and aluminum
- Working pressure rating: 1500 to 7000+ psi depending on size and material
- Temperature rating
  - With no O-ring
    - Steel: \(-65^\circ\) to \(500^\circ\) F
    - Stainless steel: \(-425^\circ\) to \(1200^\circ\) F
    - Brass: \(-325^\circ\) to \(400^\circ\) F
    - Aluminum: \(-325^\circ\) to \(400^\circ\) F
  - With O-ring: depends of temperature rating of o-ring compound
Thank You

Questions?

Together, we can engineer your success. Starting today.