



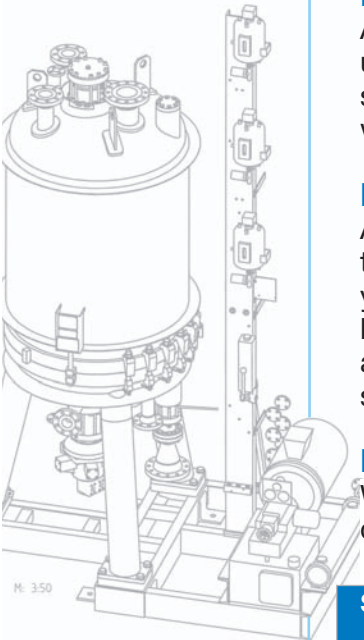
Pall Corporation



# Technology Services

*"We Speak Your Language"*

**Pall Technology Services: ZHF- and ZEF-Type Systems**



### Partner with Pall Technology Services

Achieve the best return on your investment through superior system performance, uptime and reliability. Install, start-up and optimize your system properly. Train your staff to operate, maintain and manage your system with understanding and confidence, with Pall experts at your call for system support, updates and upgrades when needed.

### Leverage Pall Technology Experience

A global resource of Pall engineers, programmers and technicians equipped with the latest technology and software is ready to provide value-added field engineering support of your Pall system. Use Pall professional resources to identify and resolve technical issues before they impact production. Achieve your performance and financial goals without adding overhead or headcount. Focus on your core business while Pall focuses on your system and process.

### Benefit from Pall System Services

We'll work with you to optimize system performance, reliability and run-time, product quality, reduce cost, and realize a faster, better return on your investment.

#### Service Agreement

Service Number: 510-000

**Selected Technical Services to support ongoing system operation and maintenance needs. Planned, routine updates to process, software, and O&M protocols and pro-active maintenance cost-effectively identifies and resolves issues before they become critical.**

#### Benefits

- Optimal system reliability, up-time, and performance
- O&M staff remain trained & confident
- Quick response to emergency needs
- Reduced O&M costs

#### Deliverables

- Technical Support
- 24/7 Service Support (Regional Availability)
- Emergency Service
- Optimization
- Inspection and Maintenance
- Troubleshooting and Repair
- Refresher Training
- Spare Parts Inventory Management
- Detailed Reports

#### Pilot Testing

Service Number: 510-010

**On-site demonstration and assessment of Pall technologies with your process fluids by Pall process experts using specialized pilot test systems.**

#### Benefits

- On-site demonstration of Pall technology with your process fluids
- Understanding site-specific system capabilities and O&M needs
- Scientific and engineering data generation for full scale system design
- Confidence in technical and economic fit of full-scale system at site

#### Deliverables

- Pilot Test System
- Protocols for Pilot Test, Sample and Monitoring
- Liaison with regulatory agencies
- Customer/operator training
- On-site Pall Test Engineer (optional at cost)
- Remote monitoring and support
- Detailed Technical Report
- Scaleable Basis for Design



**Installation Support** **Service Number: 510-020**

**A variety of Professional Installation Support Services can be provided to the customer or contractor to assist with system installation activities.**

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|--|--|
| <p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>• Manage and expedite system installation</li> </ul>   | <ul style="list-style-type: none"> <li>• Controlled installation cost and quality assurance</li> </ul>   |
| <p><b>Deliverables</b></p> <ul style="list-style-type: none"> <li>• Site Survey</li> <li>• Control Installation Cost</li> <li>• Installation Management</li> </ul> | <ul style="list-style-type: none"> <li>• Quality Assurance</li> <li>• Installation Oversight</li> <li>• Third Party Inspection</li> <li>• Manage Installation Checklists</li> <li>• Reporting</li> </ul> |

**Commissioning and Start-up** **Service Number: 510-030**

**Pall can commission and start-up new, relocated, or rebuilt systems with confidence.**

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|--|---|
| <p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>• Expedited system start-up</li> </ul>   | <ul style="list-style-type: none"> <li>• Proper system integration and configuration</li> <li>• Smooth transfer of system ownership</li> </ul>  |
| <p><b>Deliverables</b></p> <ul style="list-style-type: none"> <li>• On-site Commissioning Management</li> <li>• Verify drawings, commissioning procedures, scope of supply, work details, and specifications: Electrical, P&amp;ID, Layout, Details</li> <li>• Verify all utilities including electric, water, drain, air, etc.</li> <li>• Functional specification</li> <li>• Inspect all system components, piping, seals, and alignments</li> </ul> | <ul style="list-style-type: none"> <li>• Operation &amp; Maintenance training</li> <li>• Prepare and manage detailed Action Item Checklist</li> <li>• Documentation and oversight of changes, repairs, errors and omissions</li> <li>• Instrument loop and calibration checks, check rotation of all rotating equipment</li> <li>• Supervise system assembly, start-up and system function test</li> <li>• Adjust controls and instrumentation as required</li> </ul> |

**Integration – Process and Control** **Service Number: 510-040**

**Integrate the process control of multiple systems and components so they work properly together as required. Includes process design, programming, implementation, and test services.**

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|---|---|---|
| <p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>• Efficient and effective integration of process and controls</li> <li>• Increased system reliability and performance</li> <li>• Documentation to support Operation and Maintenance.</li> </ul> | <p><b>Deliverables</b></p> <ul style="list-style-type: none"> <li>• Process Engineering</li> <li>• Control design</li> <li>• Programming</li> </ul> | <ul style="list-style-type: none"> <li>• Installation</li> <li>• Testing and debugging</li> <li>• Troubleshooting</li> <li>• Optimization</li> <li>• Documentation</li> </ul> |
|---|---|---|



**Technical Support** **Service Number 510-100**

**Pall service contracts provide unlimited technical support via telephone or email, and fax support during regular local business hours, excluding weekends and holidays.**

- Benefits**
- Quick response to technical questions
  - Increased system uptime
  - Troubleshooting and corrective action recommendations

- Deliverables**
- Pall engineering support via phone or email
  - After-hours service provided at standard rate

**24/7 Service Support** **Service Number 510-120**

**Pall Service Hotline provides Service Support to customers under contract, pending regional availability.**

- Benefits**
- Quickly troubleshoot and restore operation when system goes down
  - Minimize the cost of lost production.

- Deliverables**
- Service Hotline - service requests and questions
  - Access to Pall System Engineers
  - Response to calls within specified time
  - Technical support
  - Expert troubleshooting and corrective action via modem and phone
  - Coordinate emergency service as needed

**Emergency Service** **Service Number 510-125**

**On-site emergency service is provided when technical support via phone and remote monitoring via modem cannot resolve the problem, or when on-site support is needed.**

- Benefits**
- Restoration of system operation
  - Timely and efficient troubleshooting and repair

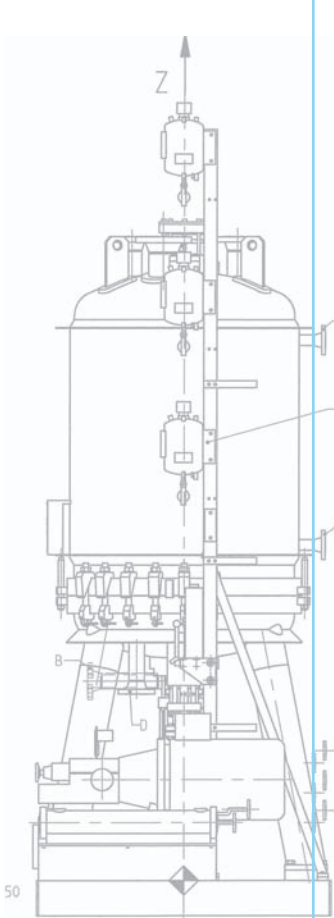
- Deliverables**
- Unscheduled on-site technical support
  - Troubleshooting and corrective maintenance
  - Detailed service report

**Optimization – System and Process** **Service Number 510-130**

**Measure and maximize the performance of your system; troubleshoot and optimize the process by adjusting configuration, process, operation and maintenance protocols.**

- Benefits**
- Superior system performance
  - Reliability and process efficiency
  - Cost-effective operation
  - Reduced maintenance costs.

- Deliverables**
- Observe, test and adjust
  - System configuration
  - Pre-coat and DE feed rate
  - Control program
  - Process setpoints and timers
  - Cleaning protocol and control
  - Inspect the system, observe O&M protocols
  - Evaluate effectiveness, modify and revise as required
  - Recommend upgrades to process and components
  - Detailed technical report





**Inspection and Maintenance** **Service Number 510-140**

**A comprehensive inspection and maintenance service that combines required service, complete inspection and test of the system components, process, and controls; hardware and software are adjusted, repaired, and updated as required.**

- Benefits**
- Identify and resolve system operation and maintenance issues
  - Improve system performance, reliability, efficiency, and availability
  - Minimize production loss and O&M costs.

- Deliverables**
- Inspect and evaluate ZHF filter
  - Disassemble system, remove and clean all filter elements
  - Filter element inspection
  - Inspect bearings, shafts, seals and sealing surfaces
  - Replace upper shaft seal, element seals, and vessel seal.
  - Assembly of filter stack and filter
  - Address leaks, vibrations, noises and irregularities
  - Observe pre-coat and start of filtration
  - Re-establish reference for clean flow in filter
  - Evaluate operation, filtration, cake discharge and cleaning cycles
  - Support process and program adjustments and modifications
  - Hardware–software adjustment as required
  - Detailed Technical Report

**Upgrades** **Service Number 510-200**

**Pall systems may be upgraded in several ways: Hardware, Software, Process, and Protocol**

- Benefits**
- The latest version of software, O&M protocols
  - Improve performance and process
  - Increase reliability
  - Reduce O&M costs

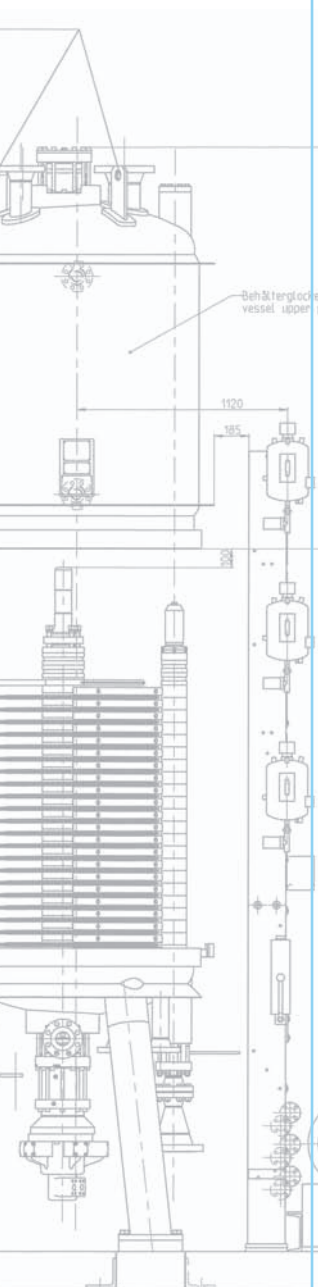
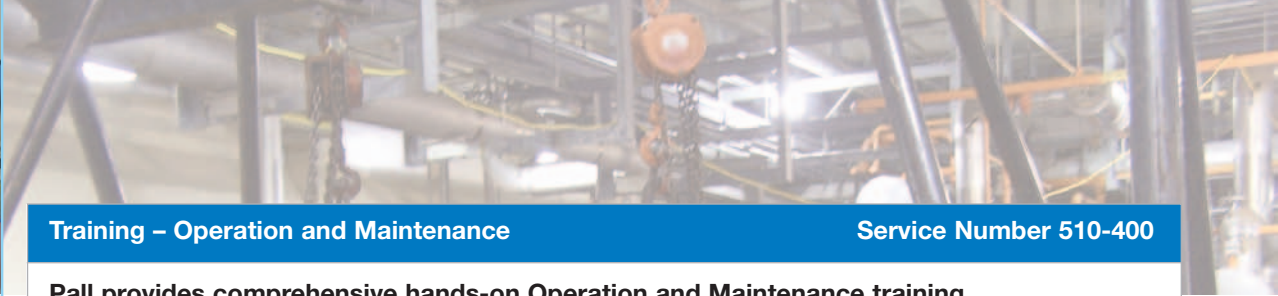
- Deliverables**
- Updated process protocols and programs
  - Replace obsolete computer systems, controls, hardware, firmware, and software
  - Upgrade filter elements, shafts, screens, and seals
  - Upgrade screened elements where appropriate
  - Upgrade hydraulic to variable speed electrical drive for better control
  - Customize process controls to suit operational needs and preferences
  - Detailed Report

**Element Rescreening** **Service Number 510-250**

**Elements can be properly rescreened at the factory, or on-site when required. Mobile rescreening jig and fixtures can be used in the field for quick turn-around and return to production.**

- Benefits**
- Restore system performance with proper rescreening
  - Improve performance with rescreening upgrades
  - Quick turn-around; minimized downtime cost

- Deliverables**
- Rescreen and rebuild elements off-site or on-site
  - Pall quality rescreening
  - Upgrade screened elements



**Training – Operation and Maintenance** **Service Number 510-400**

**Pall provides comprehensive hands-on Operation and Maintenance training.**

- Benefits**
- Superior system performance and operating costs
  - Educated O&M staff understand the system, operate and maintain it properly.

- Deliverables**
- Comprehensive Operation and Maintenance Training
  - Hands-on and/or classroom-based
  - Periodic Refresher Training

**Parts Supply** **Service Number 510-500**

**Pall can support your system parts and ongoing maintenance needs.**

- Benefits**
- Increased uptime and reliability
  - Reduce lost production
  - Quick repair with correct parts

- Deliverables**
- Repair parts and spare parts
  - Recommended spare parts list
  - Critical / long-lead parts list

**Spare Parts Inventory Management** **Service Number 510-550**

**Review and manage your spare parts inventory. Identify critical (long-lead time) and routine repair-parts; manage on-site parts stock so they are available when needed.**

- Benefits**
- Increased system uptime and reliability
  - Reduced downtime and lost production
  - Fast repairs with factory-correct parts
  - Proactive planning lowers cost of parts and repair

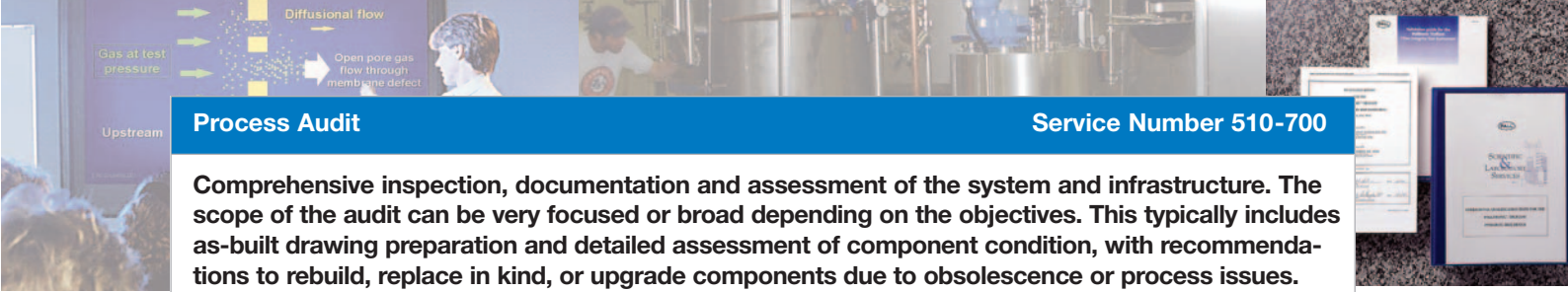
- Deliverables**
- Preventive maintenance programs include wear part replacement schedule
  - Recommended and critical parts lists.
  - Routine and Critical Parts Inventory Report, checks and updates

**Process Consulting** **Service Number 510-600**

**Leverage Pall's technical insight, expertise, and experience to increase your process, production and maintenance effectiveness. Identify opportunities for latest process updates, enhancements and improvements.**

- Benefits**
- Superior system and process performance, production and reliability
  - Increased process efficiencies
  - Reduced operating cost

- Deliverables**
- System, process and protocol evaluation
  - Identify effectiveness and opportunity for improvement
  - Introduce latest and best protocols
  - Implement and test new protocols
  - Adjust and optimize as appropriate
  - Detailed Technical Report with recommendations



## Process Audit

Service Number 510-700

**Comprehensive inspection, documentation and assessment of the system and infrastructure. The scope of the audit can be very focused or broad depending on the objectives. This typically includes as-built drawing preparation and detailed assessment of component condition, with recommendations to rebuild, replace in kind, or upgrade components due to obsolescence or process issues.**

### Benefits

- Understand the status of the existing system and peripheral equipment
- Determine technical and financial basis to repair, upgrade or replace existing system and/or peripheral equipment

### Deliverables

- System and process audit report
- Technical and financial analysis
- Technical recommendations
- Asset management map
- As-built P&ID drawings
- Detailed component assessments
- Repair/Replace/Upgrade recommendations
- Parts and detailed repair parts lists
- Identification of maintenance and cost issues
- Management alternatives and recommendations
- Future system maintenance needs and budget projections
- Quotations for repair and replacement parts and equipment
- Proposals for repair, upgrade, and replacement work
- Proposals for future system service support.

## Documentation Updates

Service Number 510-750

**Update documentation and drawings to show as-built system integrated with peripheral equipment. Update P&IDs, manuals, process protocols and control documents. Ensure document accuracy to properly support routine operation and maintenance, system expansion, and regulatory reports.**

### Benefits

- Cost savings through efficient operation and maintenance of the system
- Satisfy regulatory reporting requirements
- Facilitate system expansion and upgrades

### Deliverables

- Updated as-built drawings
- Revised O&M manuals, updated vendor manuals
- Updated operation and maintenance protocols
- Updated process control documents

## Fluid Analysis

Service Number 510-810

**Fluid analysis can identify a process fluid issue that emerged during operation or a potential issue prior to system installation. Laboratory analysis of the fluid is often utilized to identify what specific contaminants or chemistry may cause process issues.**

### Benefits

- Understand process issues
- Restore or improve process performance
- Avoid potential issues
- Determine and implement alternative solutions

### Deliverables

- Fluid Analysis Report
- Examine and analyze fluid feed to system
- Identify contaminants and chemistry
- Determine effect on process and fouling potential
- Recommendations for resolution, or further investigation



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