ITT

Plant Performance Services

Lowering the total cost of pump ownership.

Engineered for life

ProActivity

Shop-floor to top-floor optimization of pump systems and infrastructure.

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REsolve

Root cause analysis and engineered solutions for bad-actor systems.

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Efficiency

Pump system optimization that significantly lowers energy bills.

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Monitoring

Advanced data gathering and analysis for all types of rotating equipment.

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Design

Engineering support services that design-in reliability and efficiency.

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Repair

Expert remanufacturing that lowers maintenance costs and improves uptime.

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Learning

Educational services to raise your staff's pump and reliability system expertise.

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Inventory

Inventory and supply chain improvements for greater efficiency.

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Why ITT?

Plant Performance Services are based upon ITT's unrivaled service and application knowledge and pump system expertise. You'll gain access to the deepest bench of resources and breadth of experience that exist anywhere in the world. ITT brings a sharp, unwavering focus to the issue of efficient pump ownership that most plants simply don't have the time or mandate to sustain. We'll dig deeper, apply state-of-the art technology and wring out more inefficiencies than plant managers or companies can do alone.

Reduce total cost of pump ownership with ITT Plant Performance Services.

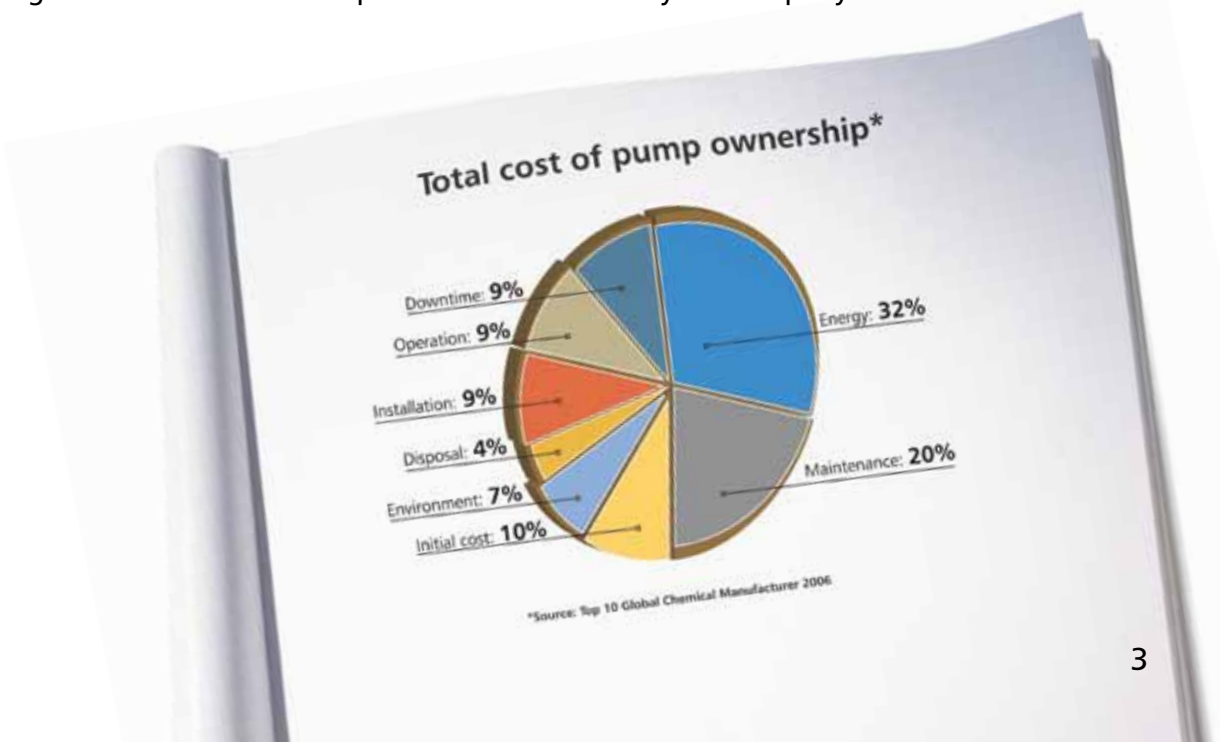
For many plant managers, the pie chart below is a real eye-opener. As you can see, the initial pump price is only a small fraction of the total cost of pump ownership. In fact, it's maintenance, energy and downtime that comprise over 60 percent of your real costs, year after year.

Think about it. Companies that operate hundreds of pumps have a large—often multimillion-dollar—cost savings opportunity staring them right in the face. One you simply can't afford to miss. These are costs that you can address and aggressively bring under control.

In fact, ITT Plant Performance Services can typically return savings of up to 25 percent annually. Depending upon your situation, significant savings accrue by realizing some or all of the following:

- Longer equipment life
- Lower maintenance costs
- Lower energy costs
- Improved technical support
- Increased equipment efficiency
- Improved quality of repairs
- Reduced turnaround time
- Reduced parts/inventory costs
- Better trained in-house staff
- Improved safety

ITT Plant Performance Services can be deployed as stand-alone or integrated solutions. It all depends on the needs of your company.



Comprehensive plant optimization.

ProActivity is the most powerful service ITT offers because it incorporates the widest-ranging survey and most in-depth analysis, and culminates with an implementation phase that delivers results. It is your surest path to lowering costs by identifying and eliminating inefficiencies in your plant's installed pumps and support infrastructure.

What kind of savings can you expect?

- A sharp reduction in unplanned equipment failures and improvements in overall mean time between repair (MTBR)
- Prioritization of maintenance activities and reduction in component wear
- Reduction in downtime, through inventory optimization—the right part at the right time
- A marked decrease in overall energy consumption
- Increases in production availability—top-line improvements that can add greatly to the bottom line

Phase 1 Assessment

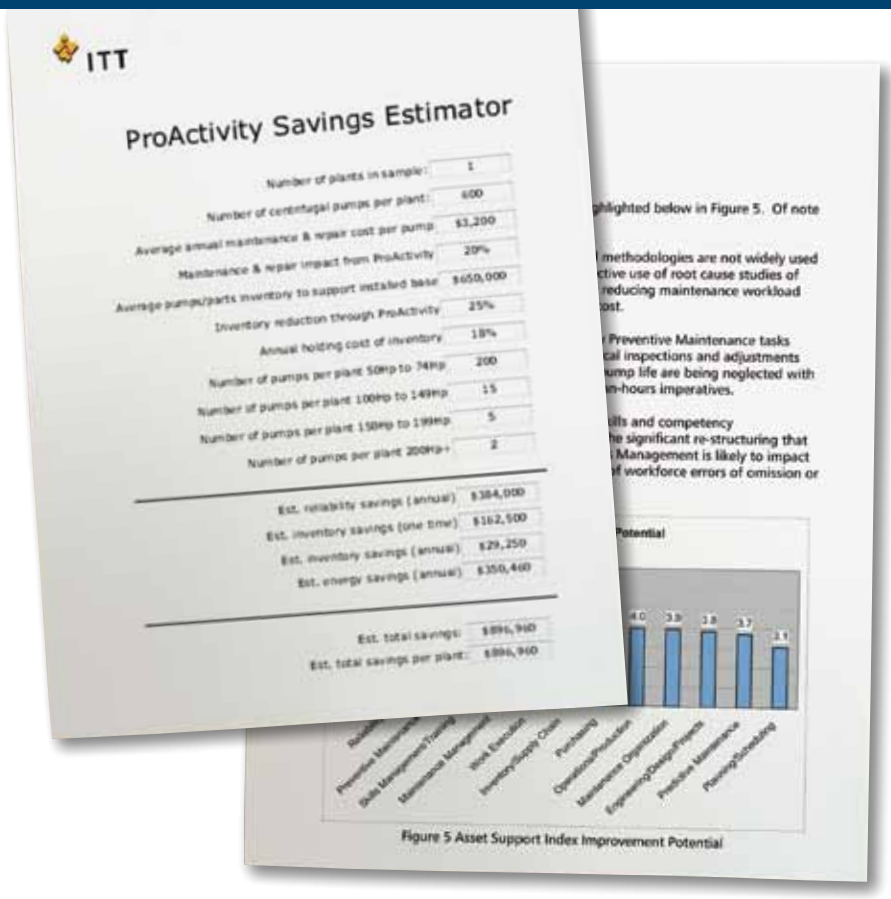
A two-day on-site engagement to baseline your facility and identify areas for improvements and savings. Deliverable includes a detailed report that provides an assessment of your current maintenance support effectiveness, the overall condition of your equipment and a projected return on investment (ROI).

Phase 2 Gap Analysis

A highly detailed engagement that compares your current state to peers and best-in-class examples. We will develop a road map for optimizing the operation and maintenance of your pumps. Our report will provide a specific action plan and detailed ROI.

Phase 3 Implementation

ITT will directly or indirectly support implementation of cost-saving initiatives at your plant. These initiatives will establish a continuous cycle of identification, elimination of inefficiencies and optimization of processes.



Case Study

A multibillion-dollar supplier of basic and specialty chemicals

In the first four years since the implementation of ProActivity, mean time between failure (MTBF) for pumps has improved 71 percent, netting $1.5 million in operations and maintenance savings.

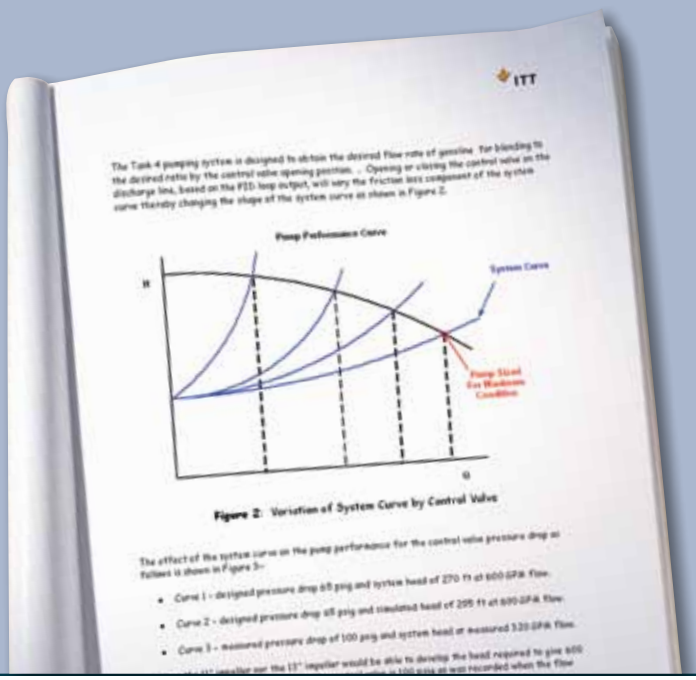
ProActivity phase 1 baseline report and ROI calculation.

An ITT specialist capturing equipment data directly into ProWare, a proprietary computer reliability software program.

Sophisticated root cause analysis that resolves bad-actor systems.

One of the most persistent drains upon your plant's resources can be a critical pump system that repeatedly fails, underperforms or is simply inefficient. The associated maintenance costs, energy costs, downtime and even process inconsistency can be surprisingly expensive. Often these bad-actor systems were improperly designed at the onset. Others have been so modified over the years that their original design intention has been obscured or subverted, resulting in problems and unnecessary expense.

That's where ITT REsolve comes in. This service employs a highly tactical,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Pump Performance Curve

System Curve

Figure 2: Variation of System Curve by Control Valve

Analytical reports like this state root cause and recommended solution to a bad-actor situation.

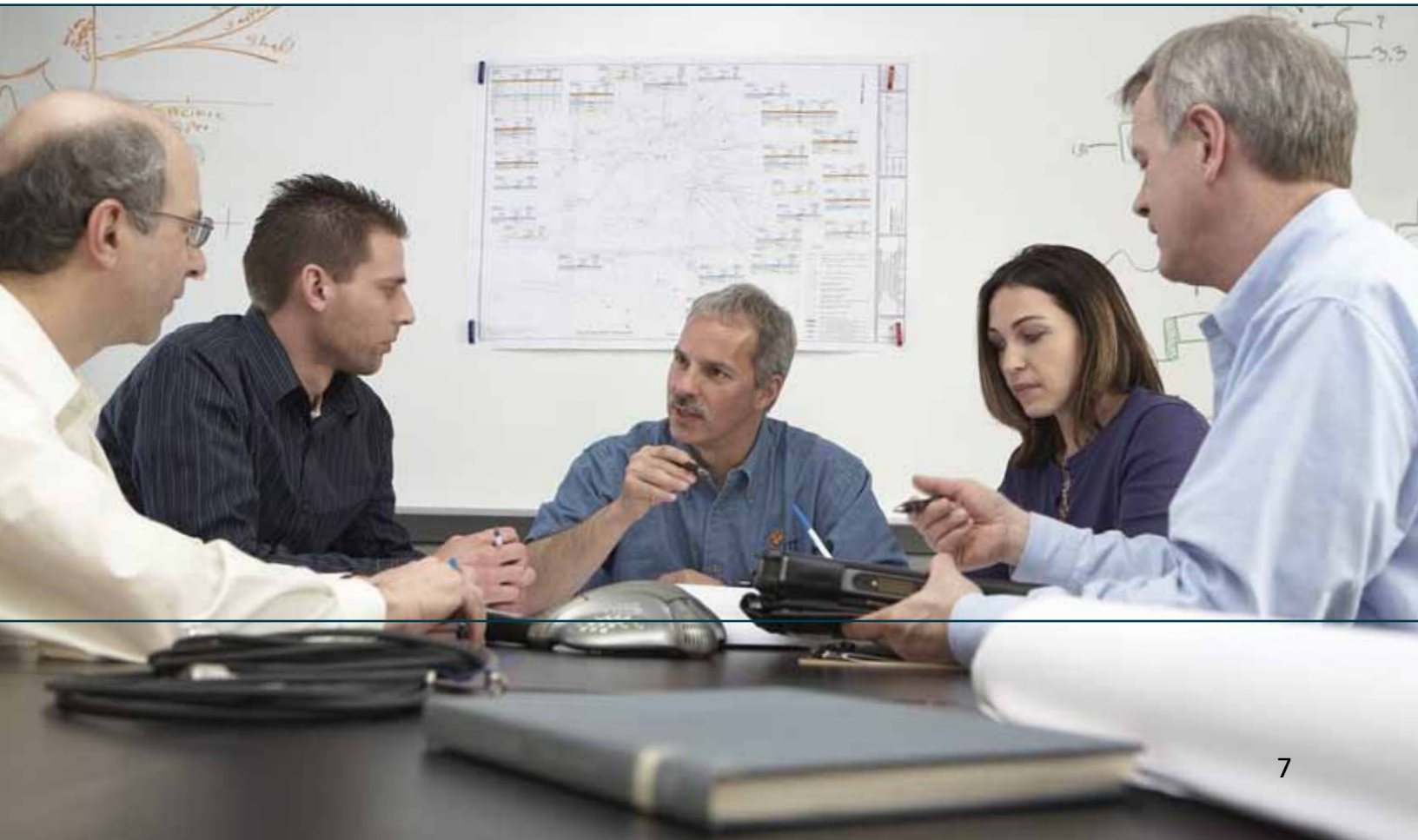
Technician installing wireless, internet-enabled REsolve instrumentation.

SWAT-team approach to resolving your bad-actor problem. We assemble the appropriate instrumentation, personnel and expertise on a temporary basis to gather the data needed to analyze the root cause of the problem. State-of-the-art equipment that can measure vibration, temperature, suction pressure, discharge pressure, flow and other critical inputs is utilized by the team to understand what is happening in the system. Experienced and knowledgeable experts are brought in as required to address system, hydraulic, mechanical and material issues. Our experts then engineer a cost-effective solution to resolve the situation once and for all.

Case Study

Pasadena Refining Systems, Inc., a company that refines up to 120,000 barrels of oil per day

ITT REsolve conducted a Cause, Cost, and Correction Analysis (C3) on 30 bad-actor pumps. Over two years, repair costs have been cut by 75 percent, and emissions by 95 percent.



ITT REsolve teams work with functional experts to determine root cause of failure for critical equipment.

Reduce your plant's largest energy expenditure by 20 to 60 percent.

Fact: the largest consumers of industrial motor energy in your plant are almost certainly the centrifugal pumps moving fluid through your operation.

The good news is that optimizing your pump performance can achieve 20 to 60 percent improvement in energy and maintenance costs. The kind of improvement that can make all the difference in today's tough economic environment.

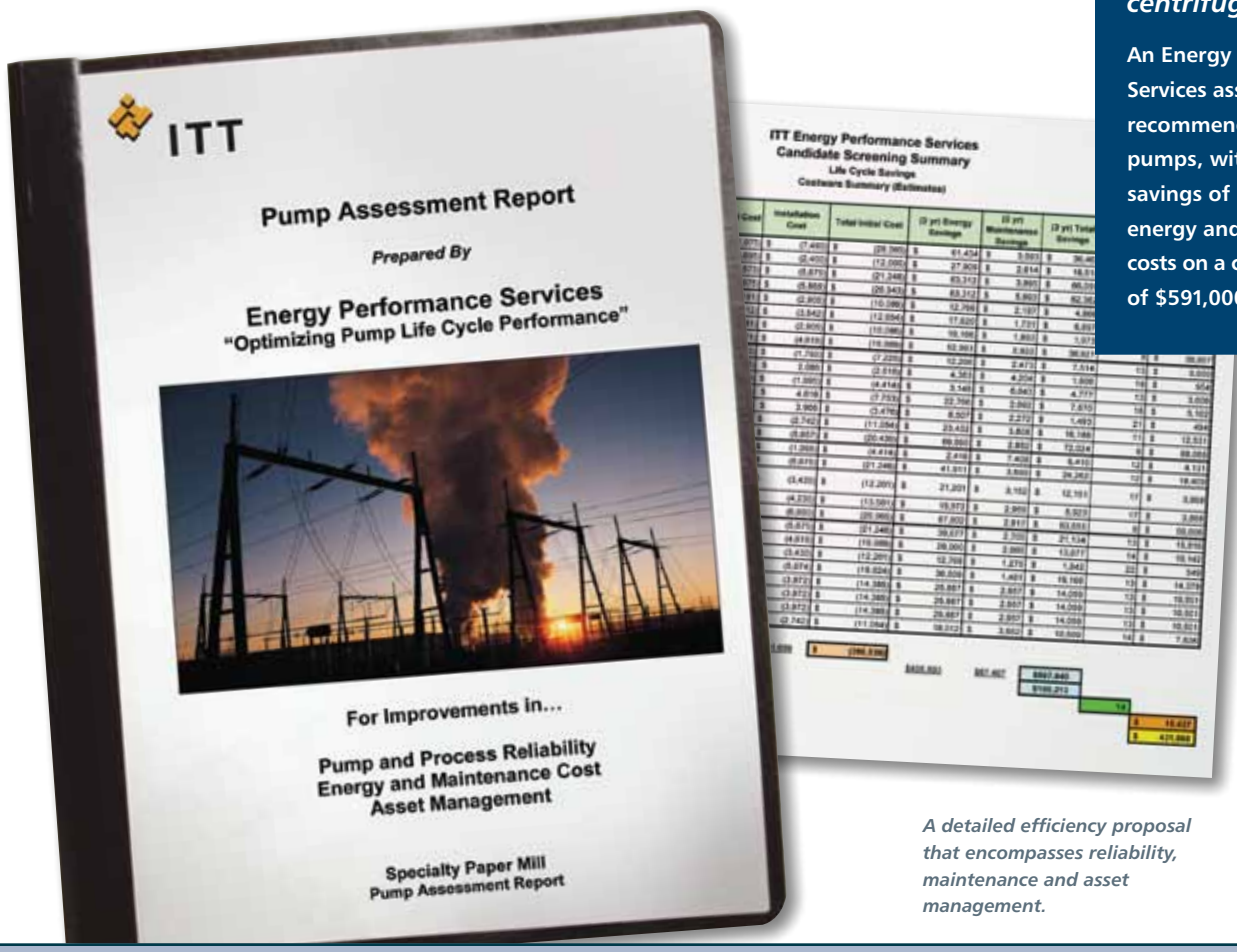
ITT Energy Performance Services identifies a plant's pump systems that can most benefit from optimization, then studies these systems to recommend specific pump system, process and control modifications that will increase efficiency. This not only lowers energy costs, but also decreases system variability and increases reliability, because wasted energy is no longer going into destructive forces.

In the Motor Control Center (MCC), an Energy Performance Consultant collects information that will be used to identify a new saving opportunity.

Case Study

Appleton Coated, a large paper manufacturer with over 1,000 centrifugal pumps

An Energy Performance Services assessment yielded recommendations for 23 pumps, with a projected savings of $1.1 million in energy and maintenance costs on a capital investment of $591,000.



A detailed efficiency proposal that encompasses reliability, maintenance and asset management.

Pump System Screening

ITT performs a preliminary survey to collect pump information and system drawings. The data are reviewed to prioritize savings opportunities.

Pump System Assessment

A process that includes interviewing key personnel, collecting system data and analyzing system optimization alternatives. A detailed, actionable report, ROI estimate and implementation recommendations are then prepared.

Did you know?

Oversized pumps and throttled valves are the two major contributors to efficiency loss. Pumps operating far from the best efficiency point (BEP) increase excess energy, which results in higher vibration levels and stress. These conditions can lead to inordinate maintenance costs and frequent downtime. ITT Energy Performance Services can significantly improve these factors.

Predictive maintenance advanced data analysis and needs assessment.

ITT ProAnalysis services provide comprehensive, in-depth and actionable monitoring that includes data gathering and interpretation of the health of all your rotating equipment.

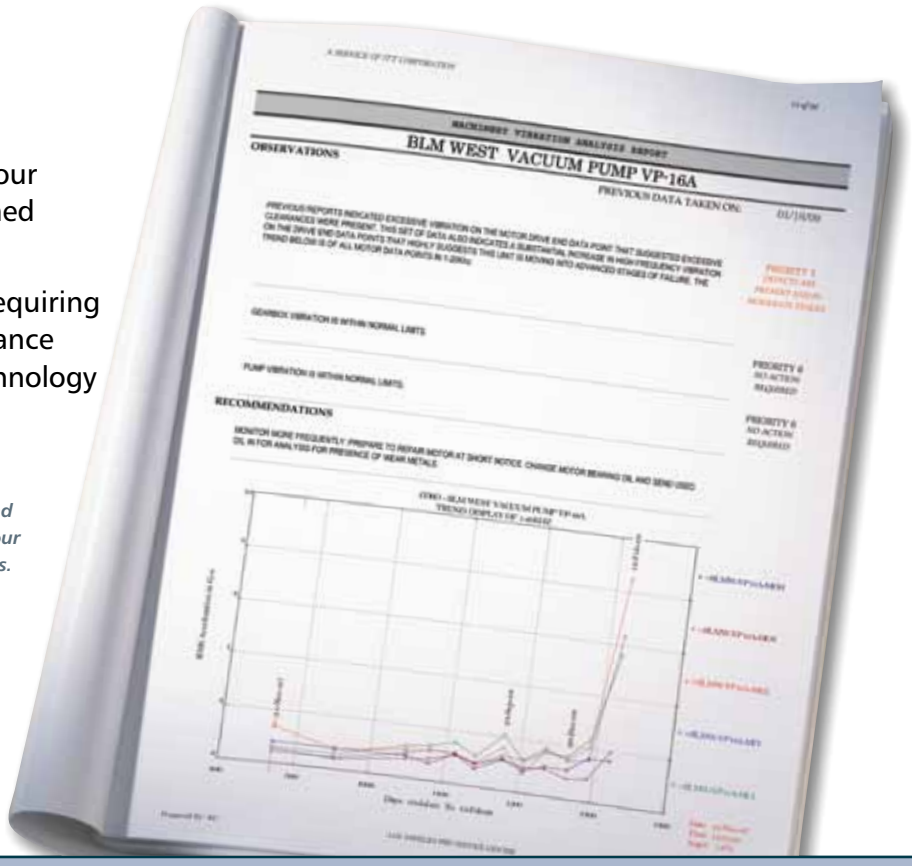
Our team of certified analysts gives you the information you need to make critical production and maintenance decisions. Decisions that will improve your processes, enhance the overall reliability of your plant and safeguard against unplanned machinery failures.

Advanced data-gathering capabilities include ITT ProSmart® remote monitoring systems, hand-held instruments and customer supplied electronic data that provide continuous, predictive monitoring of rotating equipment.

Online data live from a customer's equipment is reviewed by an ITT Monitoring Specialist in order to identify and diagnose a problem.

ITT can improve the overall reliability of your plant while safeguarding against unplanned machinery failures.

Best of all, we accomplish this without requiring your staff to become predictive maintenance analysts or having to source the right technology for the job.



Actionable reports and consultation guide your maintenance activities.

ITT ProAnalysis is available at four distinct levels in order to meet your exact needs:

Periodic

Provides continuous monitoring and periodic analysis of machine health.

24/7

Highly responsive predictive consultation and around-the-clock analysis support.

Custom

PdM programs with the right technologies and support level to fit your needs.

Needs Assessment

Analyzes the criticality, failure history and condition of your installed base to provide a blueprint for your PdM program to follow.

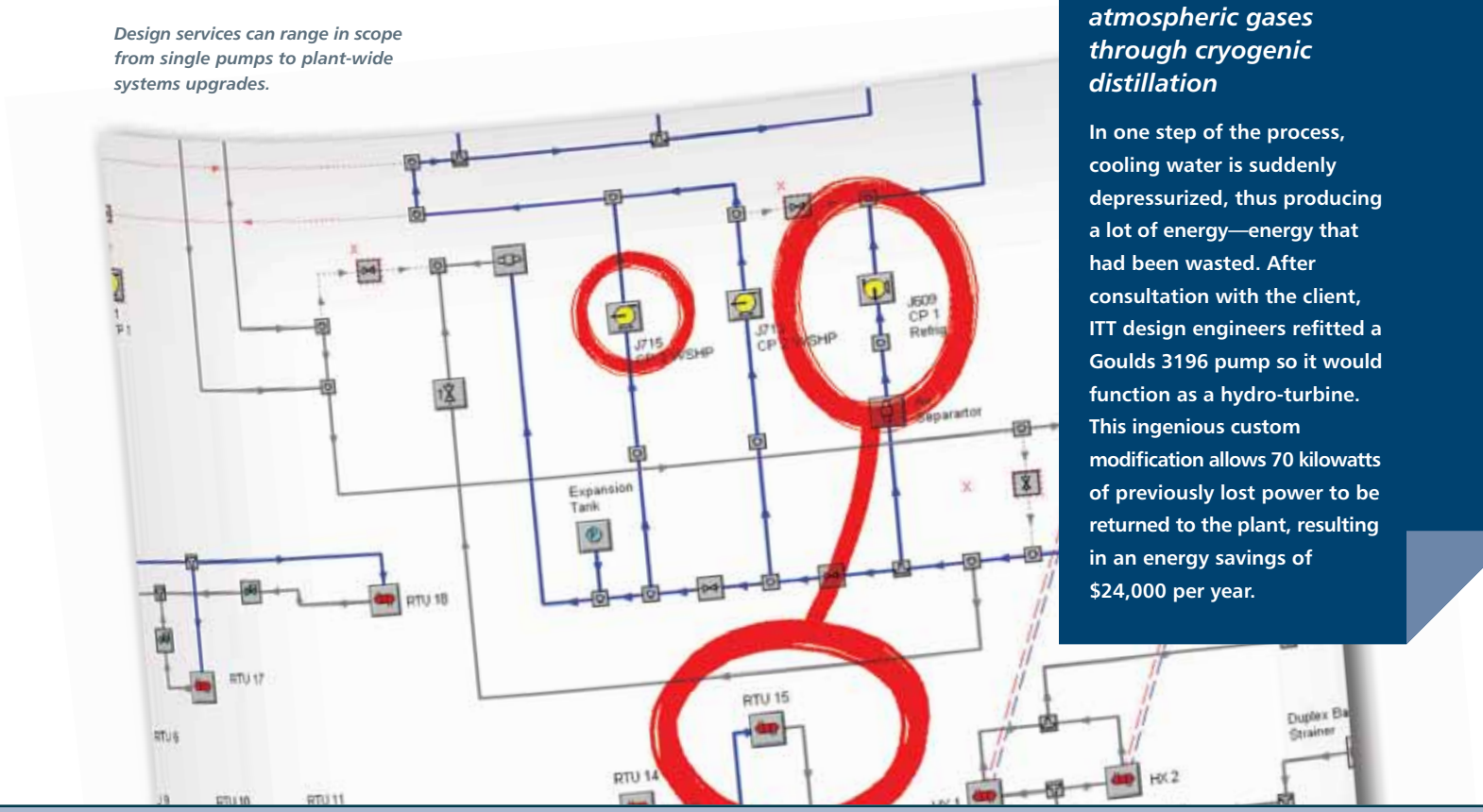
Engineering Support Services from ITT reduce costs, increase reliability, and save time.

ITT Engineering Support Services provide custom design and upgrading services to a wide variety of sectors, including the oil and gas and power industries. Projects range in scope from custom pumps to system design that builds-in reliability and efficiency. Our engineering and production staff is equipped with the latest technology and training to quickly tackle upgrades and performance enhancements. Upgrades can usually be accomplished without changing basic infrastructure components such as pump casing, overall length, piping base plate or existing driver.

Efficient designs can help you realize savings in initial engineering design of new plants and equipment, maintenance and operational costs. You can expect reliability improvements, reduced energy consumption, extension of equipment life, an improvement in best efficiency point, and optimization of assets.

An ITT Systems Engineering Specialist developing a new product design that will significantly upgrade the performance of a customer's existing equipment.

Design services can range in scope from single pumps to plant-wide systems upgrades.



Case Study

A large chemical company that produces atmospheric gases through cryogenic distillation

In one step of the process, cooling water is suddenly depressurized, thus producing a lot of energy—energy that had been wasted. After consultation with the client, ITT design engineers refitted a Goulds 3196 pump so it would function as a hydro-turbine. This ingenious custom modification allows 70 kilowatts of previously lost power to be returned to the plant, resulting in an energy savings of $24,000 per year.

Services include:

API Pump Upgrades

Upgrading your older style hydrocarbon processing pumps to today's latest performance standards will lower total cost of ownership and keep you in government compliance.

System Design

Engineering services that optimize system design utilizing ITT's unrivaled application knowledge and hydraulic expertise. Involvement starts at the initial stage of engineering design.

Finite Element Analysis

Uses state-of-the-art software programs. Field service problem-solving and design verification can be performed quickly and cost-effectively.

Material Upgrades

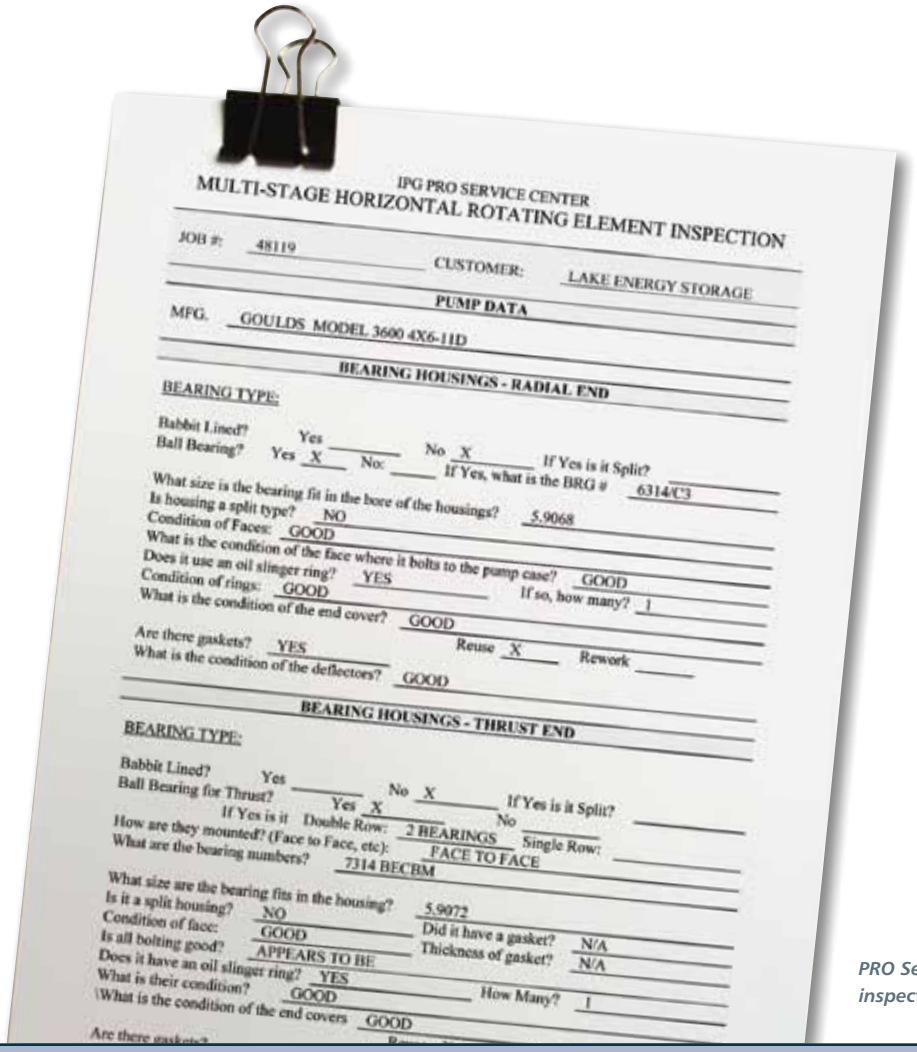
An economical alternative to replacing worn or corroded liquid-end parts with the same metallurgy. Part life can often be doubled just by selecting the right material for the application.

Expert repairs and remanufacturing that save money now and in the future.

Every piece of equipment eventually requires repair or rebuilding, no matter how well it's designed or maintained. ITT PRO Services® provides world-class remanufacturing capability to return all types and brands of rotating equipment to OEM standards, including pumps, drivers, gear boxes, centrifuges, blowers, fans and compressors. We can extend equipment life far beyond original design, perform hydraulic upgrades to run equipment at best efficiency point, manage scheduling, and maintain and repair equipment through on-site field service or specialized service centers.

Parts supply is enhanced by our ability to source obsolete and hard-to-find parts. ITT ProCast® ISO-certified operation utilizes the latest laser coordinate measuring technology, a five-axis CNC router and a fully integrated foundry and machining facility to manufacture parts quickly.

ITT technician completing service on equipment and returning it to OEM standards.



IPG PRO SERVICE CENTER

MULTI-STAGE HORIZONTAL ROTATING ELEMENT INSPECTION

JOB #: 48119 CUSTOMER: LAKE ENERGY STORAGE

PUMP DATA

MFG. GOULDS MODEL 3600 4X6-11D

BEARING HOUSINGS - RADIAL END

BEARING TYPE:

Babbit Lined? Yes ____ No X If Yes is it Split? ____

Ball Bearing? Yes X No: ____ If Yes, what is the BRG # 6314/C3

What size is the bearing fit in the bore of the housings? 5.9068

Is housing a split type? NO

Condition of Faces: GOOD

What is the condition of the face where it bolts to the pump case? GOOD

Does it use an oil slinger ring? YES If so, how many? 1

Condition of rings: GOOD

What is the condition of the end cover? GOOD

Are there gaskets? YES Reuse X Rework ____

What is the condition of the deflectors? GOOD

BEARING HOUSINGS - THRUST END

BEARING TYPE:

Babbit Lined? Yes ____ No X If Yes is it Split? ____

Ball Bearing for Thrust? Yes X No ____

If Yes is it Double Row: 2 BEARINGS Single Row: ____

How are they mounted? (Face to Face, etc): FACE TO FACE

What are the bearing numbers? 7314 BECBM

What size are the bearing fits in the housing? 5.9072

Is it a split housing? NO Did it have a gasket? N/A

Condition of face: GOOD Thickness of gasket? N/A

Is all bolting good? APPEARS TO BE

Does it have an oil slinger ring? YES How Many? 1

What is their condition? GOOD

What is the condition of the end covers GOOD

Are there gaskets?

PRO Services pump inspection document.

ITT Repair advantages

- Repairs to all makes and models of rotating equipment
- Factory-certified service technicians
- 24-hour emergency service
- Complete foundry and machining facilities
- Inventory of replacement parts
- Pickup and delivery service
- Pump installation supervision
- Technical advisory services
- Turnkey field service capability
- Vertical turbine rebowling

Service Centers

Provides integrated remanufacturing solutions to industry through our network of direct and authorized service centers. Delivers service, repairs and parts, including teardown and inspection, nondestructive examination (NDE),

Field Service

On-site servicing of pumps and other rotating equipment of any manufacturer worldwide. PRO Services factory-trained, certified field technicians will rush to your plant to handle emergency situations 24/7/365.

Upgrade your staff's pump system knowledge and develop in-plant reliability competence with ITT.

With the operation and maintenance of pumps consuming the vast majority of your day-to-day costs, it stands to reason that a highly trained staff is a key asset for getting your total cost of ownership under control. ITT Plant Performance Learning Services (PPLS) can upgrade your staff's ability to design effective pump systems, operate and maintain pumps in a proper and safe manner, and understand and value the benefits of optimization.

In fact, staff training is an investment that will return dividends for years to come by enhancing your staff's skills and abilities as they interact with pumps throughout their life cycle. Continuing education credits (CEUs) are awarded for successful course completion.

We provide a learning continuum through a wide range of courses designed to help you optimize your facility's pumping systems. This learning curriculum utilizes both instructor-led courses and fully narrated and interactive e-Learning (Computer-Based Training) programs.

Hands-on, interactive training at your plant or a nearby ITT facility with our portable Pump System Simulator.

Courses are delivered by an experienced ITT instructor in a highly interactive classroom environment in many cities or on-site at your location. The PPLS learning opportunity provides:

- Expert facilitators
- Quality training materials
- Interactive, hands-on methodologies
- State-of-the-art equipment

The courses are modular in design and are delivered as follows:

- Open enrollment—standard course to general public
- Private classes—standard course to a specific company
- Tailored training—modified course to a specific company

The classroom experience is anchored by animated presentations that bring various pump system configurations and operating conditions to life.

The learning experience is further enhanced by our Pump System Simulator, a portable pump system that provides hands-on pump system learning in the classroom. Actual pump disassembly and assembly are conducted with portable equipment.

Multimedia and interactive materials make topics easier to comprehend.

Course offerings

e-Learning (Computer-Based Training):

- **Pump Fundamentals**
- **Basic Hydraulics for Centrifugal Pump Systems**
- **Intermediate Hydraulics for Centrifugal Pump Systems**

Instructor-led (Classroom Training):

- **Fundamentals of Reliable Pump Operation**
- **Pump System Maintenance for Reliability**
- **Fundamentals of Reliable Pump System Design**
- **Plant Optimization for Managers**
- **Lubrication for Reliability**

ITT Inventory Services optimize storerooms for significant cost savings.

ITT Inventory Services uses our extensive pump system experience to collect, analyze and implement pump and parts inventory and supply chain improvements in your plant. Essentially, we map and streamline your entire repair part replenishment process. This leads to upgrades that generate a surprisingly large return on investment. Reducing your inventories of on-hand spares saves you the time and expense of controlling nonproductive materials. We achieve further savings through the implementation of innovative processes and by leveraging the total supply chain, including ITT's extensive inventory, distributor inventories and ITT PRO Services locations.

There are four principal areas of focus:

Population Survey
- Catalog installed base
- Determine criticality
- Evaluate condition

Inventory Optimization
- Identify obsolete parts
- Standardize parts and material
- Eliminate duplication
- Recommend parts list

Leverage the Supply Chain
- Recommend subassemblies
- Identify opportunities for vendor managed inventory
- Define parts management agreements
- Identify upgrade opportunities

Evaluate Material Handling Procedures
- Recommended best practices
- Integrate planned repair schedules

Case Study

A paper mill company with more than 4,000 centrifugal pumps at five pulp and paper facilities

Each of the mills saved between $80,000 and $150,000 by implementing ITT Inventory Services recommendations. The company now stocks fewer spare parts on site and uses the space for storing paper stock instead.

With ITT Inventory Services, the entire supply chain can be effectively leveraged.

ITT Inventory Services are available in the following ways:

Value Added

Pump inventory analysis and report recommending optimal parts levels and safety stock based on usage, subassembly levels, elimination of duplicates and obsolete items, and material consolidations.

Advanced

A consultative engagement where ITT inventory specialists catalog your installed assets. Based on criticality, process conditions and our proprietary optimization process, a recommended parts list is created. We then turn our attention to your actual on-hand inventory and your parts handling procedures. Gaps from best practices are identified and a road map to implementation is created.

ITT Inventory Specialists establish data into a comprehensive database as one step in leveraging the entire supply chain, often resulting in dramatic savings.

ITT

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Plant Performance Services
RELIABILITY • ENERGY • MAINTENANCE

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