

TANK INTEGRATED SERVICES

Team

- 20+ Tank SMEs / terminals business professionals in multiple disciplines
- Access to Becht SMEs from other sectors and disciplines

Key Capabilities

- Safety Management Systems and Integrity Management Programs — Review, Audit, and Development
- Risk Assessments, including RBI Programs Development and Implementation
- Tank Integrity Program Optimization
- Support on Tank Codes Interpretation vs Regulatory Requirements
- Tank FFS & FEA
- Tank Similar Service Assessments
- Tank Hydro Exceptions
- Tank Assessments per API 2350 and Level Management Optimization
- In-Service Tank Cleaning & Retrofits Evaluations
- Non-Intrusive Inspections Evaluations
- RBWS (Risk Based Work Selection) for Tank T/As

Project Examples

- Due Diligences for Terminals Acquisitions and Conversions to Terminals / \$3MM
- Tank Integrity Program and Tank T/A Optimizations / \$5MM
- Risk-Based Inspection and Program-Wide Implementation for Terminals / RBI Assessment 1% of Tank OOS Inspection Cost
 - Equipment Reliability Plans Tool for Tank Risk Management
 - API 580 Tank Risk Based Inspection Assessment TankToolsRBI
 - API 581 Tank Risk Based Inspection Assessment
- Tank Accelerated Corrosion RCA and Recommendations
- Tank Roof Chronic Cracking RCA and Recommendations
- Asphalt Tanks Critical Zone CUI Degradation Assessment

About us

Extensive midstream expertise and experience in gas processing plants, terminals, tanks, pipelines, and gathering systems. Owner-user combined with industry benchmark perspective guides the power of a multi-discipline team of industry experts.

Subject Matter Experts (SMEs) and specialists with more than 30 years of industry experience that focus on practical solutions. Our active participation in industry organizations keeps us on top of the of new technology, standards, and regulations applicable to Midstream.

We Solve Problems –

Engineering From an Owner's Perspective

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CORROSION/MATERIALS AND INTEGRITY MANAGEMENT METALLURGY

Team

- 45 metallurgy/corrosion experts
- 8 chemical engineers/chemists, 5 mechanical engineers
- 12 inspection/NDE specialists, 3 CAD experts

Key Capabilities

- Develop Corrosion Control Documents (CCDs)
- Set Integrity Operating Windows (IOWs)
- Conduct RBI Assessments (various methods/products)
- Fixed Equipment Mechanical Integrity (FEMI) Standards and Deep Dive Audits
- Implement FEMI Programs (including determining tank inspection intervals)
- Central Engineering Support & Corrosion Problem Solving
- Conduct HTHA Detailed Evaluations
- Support FFS Assessments
- API 571 Damage Mechanisms Training
- Expert Witness Support
- Edit Technical Documents for API and NACE
- Conduct Failure Analysis

Project Examples

- Produced hundreds of CCDs/IOWs for over 40 different refineries/plants
- Implemented RBI projects for over 20 different refineries/plants
- Provided detailed HTHA results/plans for 7 refineries
- Identified numerous risks that could have led to incidents through deep dive audits

About us

Extensive corrosion and materials expertise and experience covering the refining, petrochemical, chemical, upstream oil and gas, and ammonia industries.

Subject matter experts (SMEs) and specialists with more than 30 years of industry experience that focus on practical solutions.

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MECHANICAL ENGINEERING

Team

- 100+ mechanical engineering SMEs and specialists
- Access to Becht SMEs from other disciplines (Corrosion/Materials, Rotating Equipment, Process, I/E/A, etc.)

Key Capabilities

- Fitness For Service — All aspects of API-579
- Failure Investigations — Multi-discipline team of SMEs
- Analysis — FEA, CFD, Pipe Stress, Vibration
- Rerates — All ASME VIII Div. 1 books dating back to the 1920s
- Data Acquisition — Noise/Vibration, Coke Drum Health Monitoring
- Rotating Equipment Turnaround Planning — Turnaround planning and turnaround planning reviews
- Equipment Repairs — Creative solutions, design, and leadership for challenging repairs

Project Examples

- CATOFIN air inlet header vibration mitigation and reduction of pressure drop
- FCC expander line detailed design for high-temperature operation
- Vibration analysis for unit up-rate
- Ongoing, multi-year Fitness for Service evaluations of hundreds of pressure vessels for general thinning, local thinning, dents, gouges, and other damage mechanisms
- 32-day rehabilitation of heater after suffering deflagration event
- Online replacement of coke drum shims
- Emergency Level 3 FFS provided within 36 hours
- 2000+ Brittle Fracture Evaluations provided for a single project

About us

Extensive expertise and experience in all types of process industry equipment. Our deep knowledge and experience enables us to provide comprehensive, practical, and knowledge-based answers to solve your problems.

Our Becht mechanical subject matter experts (SMEs) primarily come from large operating companies in the oil & gas and petrochemical industry, with most having over 30 years of experience.

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RELIABILITY

Team

- 20+ reliability experts and specialists with 30+ years of industry experience
- Access to Becht's multi-discipline team

Key Capabilities

- Reliability, Availability, & Maintainability (RAM) Analysis
- Criticality Assessments
- Equipment Reliability Plans (FMEA) — Becht ERP software while fulfilling requirements of API RP-580
- Reliability Gap Assessments
- Risk-Based Work Selection (RBWS) — Becht RBWS software
- Root Cause Failure Analysis
- Bad Actor Resolution
- Fire Damage Assessment
- Coke Drum HMS
- Fired Heater Assessment — Utilizing FHRisk tool
- Bundle Technology Upgrade (BTU) Program

Project Examples

- Reduced turnaround spending by \$24MM for a North American refinery
- Helped a client increase their Solomon ranking from 3rd to 1st quartile and onstream reliability from 90% to 98%
- Changed kettle reboiler to allow use of lower pressure steam, resulting in \$500k/yr in energy credits

About us

Becht's Reliability group improves the performance of our clients' manufacturing facilities by solving reliability-based issues. Experts benchmark reliability programs and recommend and implement solutions to gain sustainable improvement in plant reliability.

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PROCESS ENGINEERING & SAFETY

Team

- 250+ process engineering SMEs and specialists
- Access to Becht SMEs from other disciplines

Key Capabilities

- Cold Eye Expert Reviews of Process Units
- Root Cause Failure Analysis / Troubleshooting
- Turnaround Process Support – Planning, PSSR, Training & Inspections
- Front End Engineering and Project Development
- Owner's Engineering QA/QC Project Oversight
- Staff Augmentation
- API 751 Audits
- Quantitative Risk Analysis – Dispersion and Blast Zone Modeling
- PSM Audits & Best Practice Assessments
- Incident Investigation Facilitation & Guidance
- Relief System Analysis and Design
- PSM Program Training & Guidance
- HAZOP / LOPA Facilitation and Expert Support
- Emerging Technology Vetting and Due Diligence
- Expert Witness Support

Project Examples

- **Troubleshooting** — Crude tower coking, recycle compressor liquid carry-over, hydro processing chloride poisoning
- **Design** — Black waxy crude oil to synthetic crude, fluid solids biomass conversion, FCC regenerator cyclone replacement
- **Turnaround** — Staffing for inspection, mentoring, and training

About us

Extensive expertise and experience in virtually every refining, petrochemical, and chemical process. Subject matter experts (SMEs) and specialists with more than 30 years of industry experience that focus on practical solutions.

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ROTATING MACHINERY

Team

- 30+ machinery SMEs and specialists
- Access to Becht SMEs from other disciplines (Corrosion/Materials, Mechanical, Process, I/E/A, etc.)

Key Capabilities

- **Troubleshooting** — Process, Mechanical, Auxiliary Systems
- **Failure Investigations** — RCFA Team Facilitation & SMEs
- **Rerates** — Consultation on OEM & 3rd Party Rerates
- **Vibration Analysis & Condition Monitoring** — ISO Level 3 & 4 Certified Vibration Analysts
- **Facility Reliability Audits** — Gap Analysis & Recommendations
- **Turnaround** — Supervision & Technical Consultation, Planning, & Reviews
- **Shop Repair Support** — QA/QC Oversight & Technical Consultation
- **Capital Project Support** — Specification Development, Bid Reviews, Testing, & Commissioning

Project Examples

- Emergency Axial Compressor Blade Failure Investigation
- New Installation Boiler Feedwater Pump RCFA and Recommendations
- Shop QA/QC Supervision Compressor and Gearbox
- Pump System Vibration Troubleshooting
- Critical Installation Supervision for New Construction
- Olefins Plant Capital Project Owner's Representative

About us

Extensive expertise and experience in rotating equipment and turbomachinery. Subject matter experts (SMEs) and specialists with more than 30 years of industry experience that focus on practical solutions.

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CAPITAL PROJECTS

Team

- 20 project managers with integration of other Becht specialists
- Senior project managers with \$1B+ project experience

Key Capabilities

- **Independent Projects** — Scope, schedule, cost reviews
- **Technology** — Integration, step out, scale up
- **Repair Versus Replace Analysis**
- **Technical Projects** — Owner's representative SME review, project scoping
- **Constructability** — Owner contractor alignment
- **Turnaround Projects** — Alignment, review, and facilitation
- **Pre-startup Safety** — Training, walkdowns, procedures
- **Due Diligence** — acquisition risk and gap analysis
- Completions, turnover, commissioning and startup planning, alignment, and assistance
- Staff augmentation for key roles

Project Examples

- **FCC Project**
 - ◇ Stage gate review, turnaround alignment check, and schedule optimization exercise
- **Grassroots Petrochemical Project**
 - ◇ Quality assurance throughout the FEED, operating modes assessment, risk items identified

About us

Extensive expertise and experience in all types of capital project work.

Subject Matter Experts (SMEs) and specialists with more than 30 years of industry experience that focus on practical solutions.

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HEAVY LIFT AND HEAVY HAUL

Team

- 15+ team members supporting domestic and international projects, each with 30+ years of industry experience
- Access to Becht SMEs from other disciplines (Process, Mechanical, Rotating Equipment, Power Generation, Civil, Structural, Geotechnical, I/E/A, etc.)

Key Capabilities

- *Heavy Lift Plan Engineering Review*
 - ◇ Ground-bearing pressure & load distribution analysis
 - ◇ FEA capabilities of load-spreaders and overhead lifting devices
 - ◇ FEM capabilities of vessel and tank shell stresses and deflection due to lifts
 - ◇ Load rate crane pile cap and mat foundations, various bridge structure and box culverts for SPMT and crane loading, load rate structural steel pipe racks for stresses and deflection due to lifts, and load rate buried utilities due to crane loading
 - ◇ Investigate earth and rock slope stability due to SPMT and crane loading
 - ◇ Analyze crane suitability, rigging assemblies, and lifting device configuration for code compliance and analyze lift procedures and rigging points of attachment
 - ◇ Confirm personnel qualifications and heavy lift manual development
- *Heavy Lift Field Supervisors*
 - ◇ Highly experienced field supervisors. Ensure safe lift in accordance with approved lift plan and ensure compliance with current regulations and client's crane and rigging policies.
- *Crane and Rigging Policy Development*
 - ◇ Consultation of on-site or corporate lift policies, gap analysis, and field audits on lift equipment
- *Crane Accident Investigations and Determination of Root Cause*
 - ◇ Site walk-down and detailed root cause failure analysis. Expert witness support and litigation services.

Project Examples

- 2011 *world record* six derrick coker lift review and onsite field supervision (1,627 tons at 174 ft radius)
- Heavy lift and safety oversight for super-lift project in Pembroke, Wales, UK (516te depropanizer tower at 82m radius)
- Heavy lift manual development and field oversight for multiple super-lift projects
- Annual three-day crane competent person class, teaching 50+ personnel
- Corporate lift policy development

About us

Extensive expertise and experience in supporting refineries, petrochemical facilities, nuclear/fossil fuel electric power plants, and major civil projects worldwide that focus on practical solutions.

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TURNAROUND SUPPORT

Team

- 100 experts in plant shutdown, maintenance, projects, and startup activities
- Access to Becht SMEs from other disciplines (Reliability, Mechanical, Rotating Equipment, Process, I/E/A, etc.)

Key Capabilities

- **Technical Planning and Management** — Turnaround management, site coordination, turnaround engineering, planning/scheduling, inspection planning, project controls, document controls, procurement and contracting, safety management, heavy lift reviews
- **Turnaround Reviews** — Risk-Based Work Selection (RBWS), schedule optimization reviews, readiness reviews, post-turnaround lookbacks
- **Mentoring / Process Development** — Turnaround strategy development, execution process development, operator/technical management training, and plant personnel mentoring
- **Execution Support** — Field supervisors, discovery engineering, operations support, startup lead, logistics coordination, materials expediting, shop surveillance, quality assurance/inspection supervision, specialty technical support, field safety supervision

Project Examples

- Fluid Catalytic Cracking (FCC), Alkylation, Hydrotreater
- Entire Plant Shutdown — Crude, FCCU, Utilities, Coker, etc.
- Hydrocracker, CCR, Benzene/Toluene/Xylene, Sour Water Stripper

About us

Extensive expertise and experience in turnaround management, planning, and support services.

Subject matter experts (SMEs) and specialists with more than 30 years of industry experience that focus on practical solutions.

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HUMAN PERFORMANCE

Team

- 50+ experienced professionals to assist with organizational excellence
- Developed and delivered training in over 75 unique operating technologies
- Access to Becht SMEs across over 17 disciplines

Key Capabilities

- Assessments of Client Training
- Public & Private Technical Training
- Training Program Material Development and Delivery
- Curriculum Development and Competency Assurance
- Operations, Maintenance, and Technical Career Roadmaps
- Onsite Mentoring

Project Examples

- SASOL LCCP Unit Operator and Engineer Training Program
- MOH Training Dept Development
- Suncor Unit Operator Training Program
- Turnaround Process Engineer Mentoring Program
- Fixed Equipment Engineering Early Career Training and Operations Fired Heater Field Training
- API 579/ASME Fitness for Service and API 571 Damage Mechanisms
- Introduction to Distillation & Troubleshooting
- Fluid Catalytic Cracking
- Root Cause Analysis
- Technical Communications
- Introduction to Refining Processes
- ASME B31.3 Piping Flexibility
- Crane Competent Person Training

About us

Extensive expertise and experience in the refinery, petrochemical, chemical, and utilities industries. We will help you turn your internal resources into a dynamic workforce.

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STRATEGIC BUSINESS PLANNING

Team

- 20 strategy development experts
- 500+ mechanical, process, and reliability engineering SMEs and specialists
- Access to Becht SMEs across disciplines

Key Capabilities

- **Strategic Analysis and Evaluation**
 - ◇ Configuration Feasibility Analysis
 - ◇ Asset Performance Gap Assessment and Opportunity Identification
 - ◇ Asset Acquisition / Divestment Technical and Economic Evaluation
 - ◇ Value Chain Optimization
 - ◇ Optimization, Execution, and Logistics Modeling (LP, Blending, Event, Stochastic)
 - ◇ End-to-End Optimization Work Process Evaluation, Improvement, and Data Driven Performance Analysis
 - ◇ Turnaround Timing and Business Interruption Analysis
- **Energy Transition Planning and Analysis**
 - ◇ Green House Gas Emissions Reduction *Dynamic Planning*
 - ◇ Site-Wide Energy Efficiency Analysis / Carbon Foot Print Review
 - ◇ Bio Fuels / Hydrogen and ET Pathway Technical and Economic Evaluations

Project Examples

- Upgrade Configuration Analysis
- Unit Configuration Analysis
- Bio Feed / Reconfiguration Optimization Analysis
- Brownfield Optimization
- Greenfield Refinery Configuration Design
- Due Diligence

About us

Extensive expertise and experience in strategic analysis and optimization, focused on maximizing client value and reliability.

Subject Matter Experts (SMEs) meeting the challenges of today and tomorrow.

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