# TABLE OF CONTENTS

## COMPREHENSIVE SOLUTIONS

| Integrated Capital Project Support | 2 |

## ASSET RELIABILITY MANAGEMENT SOLUTIONS

| Maintenance and Reliability Practices Assessments | 2 |
| Maintenance and Repair Procedures | |
| Operator Rounds | |
| Reliability, Availability, Maintainability (RAM) Simulation | |
| Reliability Centered Design Analysis (RCD) | |
| Reliability Centered Maintenance (RCM) | |
| Reliability Management Data Development and Cleansing | |
| Safety Analysis | |
| Spare Parts Optimization | |
| Standard Operating Procedures | |

## ASSET INTEGRITY SOLUTIONS

| Circuitization | 5 |
| CML/TML Optimization | |
| Damage/Corrosion Analysis & Model Diagrams | |
| Data Management | |
| Design Calculations and Fitness for Service | |
| Failure Analysis | |
| Integrity Operating Windows | |
| Mechanical Integrity Assessment | |
| Mechanical Integrity Program Implementation | |
| Pressure Relief Device (PRD) RBI | |
| Program Evergreening | |
| Risk-Based Inspection (RBI) Assessment | |
| Tank RBI | |

## INSPECTION & FIELD SOLUTIONS

| Advanced Nondestructive Testing | 7 |
| Connected Field™ | |
| Eddy Current Testing | |
| Full Face Evaluation (FFE) for In-Service Flanges | |
| Inspection Drawings | |
| Inspection Planning | |
| MsS Guided Wave Testing | |
| Near Field Testing | |
| Non-Destructive Testing – UT, AUT, MT and PT | |
| On-Stream and Visual Inspections | |
| Positive Material Identification Services | |
| QA/QC Vendor Surveillance | |
| Remote Field Testing | |
| Rope Access Inspection | |
| Small-Bore Piping (SBP) UTT Procedure | |
| Tank Inspections - MFS Floor Scans | |
| Turnaround Inspections | |

## OPERATIONS & MAINTENANCE SOLUTIONS

(WATER / WASTEWATER INDUSTRIES ONLY)

| Capital Improvement Plan | 10 |
| Condition Assessments | |
| Contract Operations and Maintenance | |
| Facility Oversight by Certified Operators | |
| Operations and Maintenance Plan Development | |
| Operator Routine Duties | |
| Process Operations Consulting | |
| Septic System Assessments | |
| Sampling Collection | |
| Staffing Analysis and Audits | |
| Startup and Commissioning | |
| Temporary Staffing | |
| Training | |

## TECHNOLOGY SOLUTIONS

| CAD Miner™ | 12 |
| Circuitizer™ | |
| CMD Maker™ | |
| CMMS/EAM Implementation and Optimization | |
| Corrosion Modeler™ | |
| DataMiner™ | |
| IDMS/RBI Software Conversion/Implementation | |
| IDMS/RBI Software Selection Assessment | |
| ReliaBuilder© | |
| Sketch Packager™ | |
COMPREHENSIVE SOLUTIONS

INTEGRATED CAPITAL PROJECT SUPPORT
PinnacleART supports capital projects throughout the designing, installing, operating and maintaining phases to build asset integrity and reliability as the new equipment and systems are brought online. The key advantages to completing these evaluations within this timeframe are:

- increased integration with asset and documentation into risk evaluations,
- properly set preventative maintenance and inspection intervals, and
- assurance that all newly introduced risks are properly mitigated.

PinnacleART also has in-house inspectors to support capital projects and/or asset expansion with baseline inspections, helping to ensure more reliable corrosion rate calculations. In addition to inspection services, our integrity and reliability engineers will also implement the new data into all relevant documentation and inspection software, perform corrosion studies and an RBI analysis, and set accurate inspection schedules. By attacking reliability with a comprehensive approach, facilities are able to optimize resource utilization and costs.

ASSET RELIABILITY MANAGEMENT SOLUTIONS

MAINTENANCE AND RELIABILITY PRACTICES ASSESSMENTS
PinnacleART’s Maintenance and Reliability (M&R) Practices Assessment tool manages all aspects of M&R assessments and assessment results. The tool is populated with a full suite of M&R program elements that are linked with best practice topics and levels of performance for assessment scoring. Typical elements that are reviewed include leadership, planning and scheduling, equipment reliability, technology utilization, key performance indicators, CMMS, continuous improvement, knowledge and document management, materials management and project management (shutdown, turnaround, capital projects). Each of these elements can be customized as needed to align with a client’s own internal best practices.

A gap assessment is performed to measure the gaps between actual performance and target performance. Improvement opportunities can then be identified, including action items, responsible individuals, resource requirements, return-on-investment and implementation time.

MAINTENANCE AND REPAIR PROCEDURES
PinnacleART provides detailed repair procedures (i.e. corrective maintenance activities) for critical equipment or complex repairs. These repair procedures are set up like preventative maintenance plans within the CMMS, but are not assigned a frequency. Repairs are pre-planned with steps, access, materials, special tools needs and man-hour estimates. Planning these repair procedures in advance can streamline repairs after failures occur by eliminating the need to search for equipment maintenance manuals to locate details about the equipment or repair required. At the same time, this approach improves work quality by using pre-developed procedures that have been validated by subject matter experts. Based on equipment risk, criticality and work complexity, PinnacleART can provide guidance on which equipment repairs should have a corresponding repair procedure.

OPERATOR ROUNDS
PinnacleART can define routine operator surveillance duties to be performed by outside operations personnel. These tasks typically include daily surveillance activities (e.g. check for leaks, verify acceptable oil level), documentation of local gauge readings for trending, routine swapping of spare pumps, and other tasks that are not managed by the Computerized Maintenance Management Systems (CMMS). These rounds can be documented on paper round sheets or handheld data collection computers. Some computerized systems can allow for the collection of predictive maintenance task results, such as vibration and infrared temperature readings. These tasks are typically defined during the Reliability
Centered Maintenance study, and provide the primary basis for an effective Operator Driven Reliability (ODR) program.

RELIABILITY, AVAILABILITY, MAINTAINABILITY (RAM) SIMULATION
RAM Modeling is a component of PinnacleART’s Reliability Centered Maintenance-based asset management service that is used to simulate all of the probable future performance metrics of a given process design. The output is used to quantify the economics or other performance criteria of equipment-related decisions such as redundancy, spare parts, equipment sizing, maintenance practices and policies, quality of components, etc. For new designs, RAM is a powerful tool for evaluating design decisions affecting such things as:

- Probability of unplanned events and impacts on life cycle performance
- Buffer sizing and location
- Unit/equipment redundancy and sizing
- Process technology
- Utility requirements
- Capital or insurance spares requirements for major equipment

Throughout the life cycle of existing processes and units, RAM can be a vital tool for assisting in decisions such as:

- Maintenance philosophy, scope and timing
- Obsolescence and end of useful life (repair or replace/upgrade)
- Impact of actual failures on risk exposure and priorities of repairs
- Impact of design or process changes to maintenance, operations and control strategies
- Spare parts stocking strategy based on actual parts usage and criticality

RELIABILITY CENTERED DESIGN ANALYSIS (RCD)
PinnacleART recognizes the importance of considering reliability, maintainability and operations and maintenance costs early in the design phase of a greenfield project or facility. Our team employs a Reliability Centered Design (RCD) analysis to build reliability asset management principles into greenfield facilities before construction begins, thus reducing maintenance, repair and staff requirements, without sacrificing the facility’s operational goals.

The RCD process includes a complete review of the design from the perspective of key O&M staff, management and process experts prior to finalizing the design. Design deficiencies that affect system reliability and availability are identified and risk-justified redesign recommendations are provided to the project team for review and possible incorporation into the project design. The RCD process also provides the identification of equipment configuration best practice opportunities and critical/capital spare parts identification. RCD then forms the foundation of a reliability-based asset management program for the facility through expansion into full Reliability Centered Maintenance for the final design.

RELIABILITY CENTERED MAINTENANCE (RCM)
Reliability Centered Maintenance (RCM) delivers a set of reliability-based, proactive tasks focused on sustaining the desired functionality of systems and equipment. The PinnacleART approach to RCM enables significant resource savings compared to the original RCM process (MSG-1) and the “classic RCM” process developed for the power and process industries.

Our results, in comparison to those from other approaches, require less investment from the client (i.e. less time for client personnel involvement and less overall cost to complete the analysis), while maintaining appropriate technical rigor. The effectiveness of our results equal, and in many cases exceed, that of other more resource-intensive processes.

The RCM process directly facilitates scheduling and planning tasks so that a clear, concise priority can
be assigned to proactive maintenance and corrective tasks. It also identifies cost benefits for allowing low-risk equipment to “run-to-failure” due to the low economic, safety and/ or environmental impact. This process yields a maintenance program with the lowest base (proactive and reactive) cost.

Our RCM process involves key client personnel who have a history with the systems and equipment under analysis. We assist clients in the implementation of their proactive maintenance program by comparing the RCM-recommended tasks with existing proactive maintenance tasks, then making the necessary changes in the client CMMS, EAM and field data collection systems. In addition, PinnacleART’s experts provide hands-on training to end users to make sure the RCM skill set is embedded in the client’s processes and systems.

During the RCM process, PinnacleART’s team employs our proprietary software, ReliaBuilder® to provide clients with a fully documented plan and a fully sustainable, evergreen program.

RELIABILITY MANAGEMENT DATA DEVELOPMENT AND CLEANSING
PinnacleART develops reliability-based asset management programs that are tailored to our clients’ processes, procedures and tools. For these programs to be effective, key plant data needs to be available and up-to-date. PinnacleART works with clients to define the specific process and asset-type data required to be maintained. These requirements are compared to existing data to identify gaps. PinnacleART then provides skilled data mining and cleansing of this key data, and organizes it into integrated asset management tools and repositories. This effort can include system and equipment walkdowns, Process Flow Diagram (PFD) / Piping and Instrumentation Diagram (P&ID) red-lining, and development of custom drawings and figures necessary for a comprehensive and effective program.

SAFETY ANALYSIS
PinnacleART conducts Process Hazards Analyses (PHA) on the process design, including HazOp, Layer of Protection Analysis (LOPA) and “What-if” studies. PHAs can identify independent protection layers and assurance tasks needed for risk reduction. The analysis also provides a complete safety case for the project. As required, these analyses are in compliance with PSM, RMP, CalARP and ISO regulations. In addition, PinnacleART can combine RCM and safety analyses to reduce time commitments from project team personnel.

SPARE PARTS OPTIMIZATION
PinnacleART’s team of engineers and technicians offer detailed spare parts development and optimization support, such as developing a risk-based spare parts strategy, identifying potential spare parts and Equipment Parts Lists (EPLs), making risk-based recommendations for spare parts to be stocked, associating parts for proactive and corrective maintenance tasks, and incorporating the spare parts information into the CMMS or other material management systems. We work with clients to define a spare parts strategy, which can be based on equipment criticality and/or the risk associated with the availability of individual parts or kits. PinnacleART can review existing inventory to verify item counts and analyze usage history and risks to set appropriate minimum stocking levels and reorder points.

For new projects, PinnacleART collects spare part information from vendor data provided to the project. Our team completes a risk-based demand model based on the dominant failure modes identified during the Reliability Centered Maintenance analysis. The demand model identifies equipment and spare parts that can be justified by economic (quantitative) reasons, or by safety, environmental or other qualitative reasons. This risk-based approach allows the client to make informed decisions concerning adjustments to vendor recommended spare parts.

PinnacleART can also include existing inventory in the analysis to identify parts that are already stocked and prevent possible duplications. In addition to identifying which parts should be stocked, PinnacleART defines a minimum stocking quantity for each part that should be maintained to achieve a risk-driven minimum confidence level that the part will be available when needed by the client.
STANDARD OPERATING PROCEDURES (SOP)
PinnacleART can produce standard operating procedures for facility systems and equipment. These procedures include initial and normal start-up, normal and emergency shutdown, equipment isolation and return to service, and emergency management procedures, to name a few. PinnacleART follows client and regulatory formatting requirements as applicable. Results of safety analyses and other processes, which rely on the assurance of operating within safe limits, are employed to provide cautions and warnings within the SOPs and associated training materials.

ASSET INTEGRITY SOLUTIONS

CIRCUITIZATION
Inspectors typically split piping into “circuits” to categorize piping inventory for inspection, but traditionally, this has been done based on convenience with little thought to corrosion or risk. Instead, PinnacleART will either circuitize piping for greenfield facilities or re-circuitize piping for brownfield facilities based on variances in potential damage or risk. For example, PinnacleART can define circuits based on temperature, pressure, process or piping metallurgy, with the exact circuitization methodology customized per client based on existing procedures and inspection strategies. Once the circuitization effort is complete, PinnacleART will overlay the final set of piping circuits on the facility’s CAD Piping and Instrumentation Diagrams (P&IDs), enabling the inspection department to turn the circuit layer on and off and manage the circuits in CAD, rather than managing them on hardcopy P&ID printouts. In addition, after the electronic circuitization effort is complete, PinnacleART will deliver an electronic list of piping circuits and associated line numbers and attributes to help the inspection department manage its piping program.

CML/TML OPTIMIZATION
After a Risk-Based Inspection (RBI) analysis is complete and all susceptible damage mechanisms have been identified, PinnacleART’s internal software is used to generate reports recommending the addition and deletion of specific monitoring locations.

In addition, PinnacleART can gather all Condition Monitoring Locations (CML) data to be analyzed, use statistical analysis to evaluate the accuracy of the information and make recommendations for cleanup.

DAMAGE/CORROSION ANALYSIS & MODEL DIAGRAMS
Potential damage mechanisms, including modeled rates and susceptibilities, are identified for each asset based on a systematic review of design, process, operation and past inspection information. By combining industry standard templates and models (API 581, API 571, Compass Corrosion Guide, NACE Standards, etc.) with PinnacleART’s damage, corrosion and metallurgical expertise, a theoretical model is produced.

Once the model is built and verified by key facility stakeholders, Corrosion Model Diagrams (CMDs) are created by overlaying the following data on the facility’s systemized Process Flow Diagrams (PFDs): metallurgy, equipment liners, Post Weld Heat Treatment, insulation, operating conditions, projected damage mechanisms and projected damage rates and susceptibilities.

DATA MANAGEMENT
Good data management is essential to system reliability. PinnacleART will verify the design, process and inspection information for assets based on the documentation found in electronic and hard copy files at the site. Any hard copy files will be scanned and renamed with a standard renaming structure. The data verified can be uploaded into the Inspection Data Management System (IDMS), a Risk-Based Inspection (RBI) software or provided in a spreadsheet format. The associated design and inspection documentation can then be embedded per asset into the software or linked to a facility server or document management system (DMS).

DESIGN CALCULATIONS AND FITNESS FOR SERVICE
If equipment documentation is lacking or the current minimum thicknesses are thought to be too conservative, PinnacleART can perform design calculations for the vessel by using data-like vessel
metallurgy, design/configuration, dimensions and internal processes to output the minimum required thicknesses for the major vessel components. If this data is lacking, PinnacleART can send its field teams to strap the vessel and perform a Positive Material Identification (PMI) to feed into the calculation model.

Likewise, if a vessel has seen damage (general corrosion, localized corrosion, cracking, out of roundness, etc.) as specified in API 579, PinnacleART can perform Level 1, Level 2 or Level 3 Fitness for Service (FFS) analyses as needed to determine the vessel’s fitness for service and provide recommendations for repair or replacement.

FAILURE ANALYSIS
If a facility has a failure, PinnacleART’s team can perform lab testing and metallurgical evaluation to determine the most probable cause for the failure. Replication, metallography, x-ray analysis and qualitative assessment of remaining life and damage of components in high temperature service can be performed, depending on the type of failure.

INTEGRITY OPERATING WINDOWS (IOWS)
Since a damage or corrosion study is only as valid as the assumptions upon which it is built, PinnacleART will identify ranges and limits of key process variables (i.e. temperature, pressure, velocity and process stream constituents) within each unit and establish parameters in which assets can optimally perform. These operating parameters are prioritized by criticality level (information, standard or critical). PinnacleART provides action recommendations with associated response times, ensuring that proper communication channels exist should those Integrity Operating Windows (IOWs) be breached.

MECHANICAL INTEGRITY ASSESSMENT
The purpose of PinnacleART’s mechanical integrity (MI) assessment is to evaluate how inspection, reliability and all relevant parties effectively manage mechanical integrity at the site. The scope of work includes reviewing key process indicators and plotting them against industry best-in-class benchmarks to determine the effectiveness of the site’s mechanical integrity program. The assessment includes both quantitative and qualitative data gathered from electronic and hard copy files and during interviews with site personnel. The assessment for a single site typically takes three days.

MECHANICAL INTEGRITY PROGRAM IMPLEMENTATION
PinnacleART offers clients a mechanical integrity (MI) and Risk-Based Inspection (RBI) program for an entire site’s pressure boundary assets, including pressure vessels, heat exchangers, towers, storage tanks, piping, pump casings, pressure relief valves and critical check valves. The scope of work may include the development of a master asset list for each unit in the plant; gathering all design documentation and inspection history into an electronic library; obtaining process, operating and consequence of failure information; reviewing and validating all design and process data; and entering it into an Inspection Data Management System (IDMS) and/or RBI software program.

The IDMS and/or RBI software will be configured, damage/corrosion assessment performed, Corrosion Model Diagrams (CMDs) created, asset risk profiles generated, Condition Monitoring Locations (CMLs) assigned, and RBI plans developed for each asset. In addition, PinnacleART can supplement or completely generate a set of management procedures for the program, including training for appropriate personnel. The time for completion is dependent on the number of assets and the scope of work tailored for each plant.

PRESSURE RELIEF DEVICE (PRD) RBI
A Pressure Relief Device Risk-Based Inspection (RBI) analysis will be performed for each PRD, utilizing PinnacleART’s PRD RBI software tool. Design and process information, overpressure scenarios and inspection history will be reviewed and uploaded to the software. Risk will be calculated for both the Fail to Open (FTO) and Leak Cases, and a report will be provided identifying the inspection plans for each PRD.
PROGRAM EVERGREENING
Program evergreening is necessary to maintain the viability of reliability programs as systems change. PinnacleART can assist in ensuring the information contained in the MI/RBI program will be maintained in accordance with the site’s management of change (MOC) program to incorporate any updates to assets. These updates can include, but are not limited to, partial or full replacement of fixed assets, grading of inspection after an inspection is performed, and updates to process and operation information. These updates will be incorporated in the document management system, IDMS/RBI software, circuitized P&IDs, inspection drawings and any other documents deemed critical to the integrity program.

RISK-BASED INSPECTION (RBI) ASSESSMENT
Risk-Based Inspection is an approach used to assign risk to particular assets within a facility, and then use that risk to drive inspection strategies. In the oil and gas industry, it is guided by the American Petroleum Institute (API) RP 580, “The Recommended Practice for Risk-Based Inspection”.

PinnacleART applies RBI theory in a systematic and standardized manner that provides objective assessments and repeatable results. We also pride ourselves on possessing fluency in a variety of RBI software packages, each of which apply the API 580 concepts in a variety of ways. We are able to both effectively utilize the various packages to perform the RBI assessments, and fully train the owner/operator to manage the RBI process once the assessment is complete.

TANK RBI
A Tank Risk-Based Inspection (RBI) analysis will be performed for each atmospheric storage tank utilizing PinnacleART’s Tank RBI software tool. Design and process information, as well as inspection history will be reviewed and input into the software. A corrosion assessment will be performed, risk will be calculated for the floor, shell courses and roof of the tank, and a report will be provided identifying the inspection plans for each tank.

INSPECTION AND FIELD SOLUTIONS
ADVANCED NONDESTRUCTIVE TESTING
PinnacleART’s advanced NDT program is supported by corrosion specialists to help ensure the adequate inspection technique is being utilized to monitor / inspect the anticipated damage mechanism. PinnacleART’s standard NDT services include the following:

• Advanced Ultrasonics (AUT)
• Complete Weld Inspection
• Corrosion Mapping
• Full Face Evaluation (FFE)
• MsS Guided Wave Testing (GWT)
• Phased Array
• Shear Wave – Angle Beam Testing
• Small Bore Piping
• Time of Flight Diffraction

CONNECTED FIELD™
PinnacleART leverages Connected Field™ technology, a cloud-based platform transforming the management of inspection projects. Connected Field™ integrates real-time inspection data across a mobile application and web platform. As inspections are completed in the field, the data captured in the mobile application is immediately available across the platform. Custom inspection reports are ingrained within the mobile application and with the push of a button the report is uploaded directly to the program IDMS and web platform for real-time project KPIs. Connected Field™ directly aligns field to office as a single medium to manage the complete inspection process.
EDDY CURRENT TESTING
Eddy Current Testing (ET) is a nondestructive inspection method, based on measuring the impedance of a coil or inducing electrical currents (Eddy Currents) in a conductive material. Any changes in the coils impedance due to geometry, material changes, or discontinuities, such as pitting, erosion, corrosion, baffle fretting, cracking, and/or other anomalies will disrupt the flow of Eddy Current and produce a representative signal on the ET instrument.

ET testing is commonly used to inspect non-magnetic (Nonferrous) and slightly magnetic alloys that are conductive, such as: stainless, 90/10 Cu. Ni., brass, titanium, hastelloy, inconel, copper, monel, etc. PinnacleART provides highly qualified trained Eddy Current technicians for on-site data analysis, utilizing the most advanced, state-of-the-art software for ET testing (Multi-Scan MS 5800 / Eddyfi Ectane). This equipment enables the technician to accurately inspect any tubing in real-time with full length recording capabilities.

Eddy Current testing can be applied to heat exchangers, condensers, feedwater heaters, and AC chillers. Advantages to application include a high rate of inspection, ability to distinguish between I.D. and O.D. defect orientation, and sensitivity to gradual wall loss, corrosion, pitting, erosion, baffle fretting, cracking, etc.

FULL FACE EVALUATION (FFE) FOR IN-SERVICE FLANGES
PinnacleART’s patent pending Full Face Evaluation (FFE) provides a complete evaluation, including RF Tapering, RF Corrosion, and ID Corner Corrosion. A major challenge in the industry involves deciding which flanges to break open for inspection, as well as which ones to leave in service. Our FFE method solves this problem by accurately locating corrosion and measuring how much remaining gasket seating surface is left.

INSPECTION DRAWINGS
For brownfield facilities that do not have inspection drawings, PinnacleART can either field sketch the pertinent assets or use a 3D laser scanning team to build a 3D model of those assets. Once the sketches or models are built, PinnacleART’s CAD specialists will build 2D CAD drawings for the equipment and piping and assign CMLs, as determined by the facility and PinnacleART project team. These drawings can then be linked or embedded to the facility’s IDMS/RBI software for quick inspection reference.

INSPECTION PLANNING
PinnacleART’s team will create a strategy to determine the full scope of inspections required for specific equipment within a facility. This includes planning on-stream inspections for a unit or facility in addition to working with the facility’s turnaround planning team to create preparation and inspection plans for the pertinent assets. If the planning team also uses PinnacleART’s cloud-based mobile inspection tool, these plans can be loaded onto the tool to empower accountable execution, and linked to the client’s IDMS to ensure a seamless transition of data.

MSS GUIDED WAVE TESTING
Magnetostrictive Sensory System (MsS) Guided Wave Testing (GWT) is a nondestructive inspection method that electromagnetically generates and receives low frequency ultrasonic guided waves. The system generates tone-burst omnidirectional electric pulses into probes and detects magnetic induction changes in the material, identifying areas of corrosion. The signal received from both directions of pipe are then analyzed and reported with data analysis and reporting software.

MsS Guided Wave Testing provides rapid coverage for long-range areas, and is capable of detecting corrosion wall loss and cracks in aboveground, buried, and insulated piping, as well as pressure vessels and storage tanks. Because it provides rapid, expansive coverage, MsS Guided Wave can be used as a screening tool, identifying suspect areas of corrosion that will need to be further monitored and inspected.
NEAR FIELD TESTING
Near Field Testing (NFT) is an electromagnetic technique using an NFT probe with an internal reference to eliminate extraneous noise by having a balanced system. This new technology relies on a simple driver-pickup probe designed to provide very simple signal analysis. The NFT probes are designed to detect internal corrosion, inlet erosion, and pitting on the tube I.D. only. The NFT probes were primarily designed for the inspection of Air Coolers tubes (Fin Fans) in the range of .750” up to 3” inches in diameter.

PinnacleART provides highly qualified, trained Eddy Current technicians for on-site data analysis, utilizing the most advanced, state-of-the-art software for ET testing (Multi-Scan MS 5800 / Eddyfi Ectane). This equipment enables the technician to accurately inspect any tubing in real-time with full length recording capabilities.

Advantages of application include detection and sizing of I.D. wall loss; inspection with low fill factor and good sensitivity; high rate of inspection; and ability to establish corrosion rates.

NON-DESTRUCTIVE TESTING – UT, AUT, MT AND PT
In addition to visual testing, PinnacleART can perform Non-Destructive Testing (NDT) in the areas of Ultrasonic Testing (UT), Advanced Ultrasonic Testing (AUT), Magnetic Particle Testing (MT) and Penetrant Testing (PT).

ON-STREAM AND VISUAL INSPECTIONS
While the plant is running, PinnacleART’s team of experts are able to perform external, on-stream inspections via visuals, ultrasonics, radiography and other Non-Destructive Examination (NDE) methods. PinnacleART can do this for a select group of assets, or take over the on-stream program by performing all the inspections on an annual basis, keeping the facility in compliance and increasing reliability via the chosen Inspection Data Management System (IDMS).

POSITIVE MATERIAL IDENTIFICATION (PMI) SERVICES
If a facility is looking to verify the material of construction of its various assets to ensure or improve reliability, PinnacleART’s experts can use specialized equipment to identify the actual material in the field and relay that back to the facility for updates in the appropriate documentation.

QA/QC VENDOR SURVEILLANCE
PinnacleART will send inspector(s) to fabrication shops to audit and monitor construction or repair of vessels and piping for clients.

REMOTE FIELD TESTING
Remote Field Testing (RFT) is an electromagnetic examination which utilizes the through transmission effects to produce a resultant field that is affected by anomalies and is measured a few or more tube diameters away from the AC excitation source, without any tube magnetization or saturation.

RFT is primarily used for the inspection of ferromagnetic tubing/pipe. This inspection consists of a full length examination performed on the inside of the tube, with equal inner and outer surface discontinuity detection and sizing. The purpose of this application is to detect I.D. and O.D. degradation such as corrosion, erosion, pitting, baffle fretting, and gradual wall loss generally found in ferromagnetic tubing. The signals are interpreted with the aid of an appropriate multi-purpose reference standard.

PinnacleART provides highly qualified, trained remote field technicians for on-site data analysis, utilizing the most advanced, state-of-the-art software for ET testing (Multi-Scan MS 5800 / Eddyfi Ectane). This equipment enables the technician to accurately inspect any tubing in real-time with full length recording capabilities.
RFT can be applied to heat exchangers, boilers, feedwater heaters, and piping. Advantages to application include the capability of testing heavy wall tubes; the ability to inspect .500” up to 3” inch diameter; inspection with low fill factor and good sensitivity; high rate of inspection; and repeatability (can be used to compare historical test results in order to establish corrosion rates and remaining life).

ROPE ACCESS INSPECTION
PinnacleART rope access inspection service offers a highly efficient and proven method of gaining access to and from difficult to reach work locations to perform a variety non-destructive testing (NDT) and mechanical services. Our highly trained technicians can deliver a full line of traditional and advanced services safely and efficiently. Our rope access teams can be deployed quickly and effectively to areas without the time required for traditional scaffolding and without creating congestion below or above the work area.

SMALL-BORE PIPING (SBP) UTT PROCEDURE
PinnacleART’s patent pending Small Bore Piping (SBP) UTT Procedure provides a reliable method through use of our specialized equipment. PinnacleART’s procedure was developed by a Certified NDT Level III and is in conformance with ASNT SNT TC-1A. This method provides significant time and costs savings.

TANK INSPECTIONS – MFE FLOOR SCANS
PinnacleART will conduct Magnetic Flux Examination (MFE) floor scans for storage tanks. This process sends out magnetic waves and can look for damage on the top and bottom sides of a tank floor.

TURNAROUND INSPECTIONS
PinnacleART can staff and execute small or large turnarounds, which includes the inspection planning, inspection execution, data management, project management and associated engineering support. For PinnacleART’s holistic turnaround support, our team will ensure the risk-based equipment plans are translated to proper turnaround packages, the packages are properly executed, inspection data is fed back into the RBI program before the turnaround is over, and damage/corrosion support is provided. As part of this process, PinnacleART utilizes its mobile inspection tablet, which enables near real-time communication of data between the PinnacleART team for efficient decision-making, task execution and project management reporting.

OPERATIONS & MAINTENANCE SOLUTIONS (WATER / WASTEWATER INDUSTRIES ONLY)

CAPITAL IMPROVEMENT PLAN
Capital Improvement Plans (CIP) help facility owners prioritize repair, replacement and rehabilitation projects in the short-term. Many facilities have difficulty finding the staff or the expertise to accurately assess the current condition of facilities in order to develop a CIP. PinnacleART’s CIP services include an assessment of your facilities and existing assets; a criticality assessment to help prioritize repair, replacement or rehab activities; and cost estimates for years one through five for those specific activities.

CONDITION ASSESSMENTS
Condition assessments provide a baseline of your facility’s health that can be used as the starting point for a variety of improvement activities. Primarily, a condition assessment should provide a clear list of the current condition, and the short-term and long-term forecasting of likely condition.

PinnacleART’s condition assessments begin with a site visit, visual inspection and documentation of conditions, followed by thermal imaging, amp draw testing, vibration and more, to provide the level of detail your facility desires. We also look at key performance indicators (KPI) for performance drop off, helping us to understand what is happening inside your assets. The report detailing asset conditions can be a starting point for capital improvement planning; repair, replacement or rehabilitation projections; adjustments to maintenance strategies to prolong asset life; and other planning activities.
CONTRACT OPERATIONS AND MAINTENANCE

PinnacleART’s contract operations and maintenance (O&M) services provide facilities with the qualified staff to effectively and efficiently manage your processes and assets.

Our team has training in reliability programs to help prioritize O&M activities according to process and asset criticality, reducing reactive responses and improving reliability and availability of the facility. What this means for you is less risk of violation, and more peace of mind.

FACILITY OVERSIGHT BY CERTIFIED OPERATORS

It is often hard for small facility owners to attract the certified and qualified staff that are required to run the facility. PinnacleART offers facility oversight services to provide the high-level, certified treatment operators at a reasonable price. Our operators can provide remote or on-site facility oversight on a full or part-time basis, according to your facility needs.

OPERATIONS AND MAINTENANCE PLAN DEVELOPMENT

PinnacleART can help make O&M plans more effective by streamlining activities to make managing the facility easier. We provide an assessment of current O&M documentation, including emergency response plans, operator round duties, standard operating procedures, preventive maintenance / predictive maintenance job plans, safety plans and manuals and more. We provide a gap analysis to determine where additional or updated documentation is required, make recommendations for staffing and scheduling and optimize your O&M activities.

OPERATOR ROUTINE DUTIES

PinnacleART can help optimize operator rounds based on a criticality and reliability assessment. We use asset and process criticality to determine the activities essential to sustaining system function, and optimize Operator Routine Duties (ORDs) around these activities. These streamlined procedures also help operations staff better understand their facility.

PROCESS OPERATIONS CONSULTING

If you are having issues with your facility, PinnacleART can provide process operations consulting to pinpoint process control, design or maintenance issues that might be impacting successful treatment. We start with a review of current process conditions, loading, design and equipment maintenance. We then provide a report of our findings, including recommendations for operations strategy, maintenance or design improvements.

SEPTIC SYSTEM ASSESSMENTS

PinnacleART can provide inspection and assessment of sludge buildup in septic systems. We then develop a schedule for removal to ensure proper function, and set up a contract with a local hauler to periodically service the system.

SAMPLING COLLECTION

PinnacleART provides certified operators to perform sampling based on your WDR permit or desired inspection schedule. We coordinate all sampling activities with local labs to ensure accurate results.

STAFFING ANALYSIS AND AUDITS

PinnacleART provides stand-alone staffing analyses and audits. Staffing audits help ensure facilities are not over- or under-staffed, and verifies that operators are performing the duties required by the facility’s permit or goals. We perform an asset count, an operations and maintenance assessment and a Full Time Equivalent (FTE) analysis based on asset O&M requirements. Our staffing recommendations are transparent and are based on hours of operation and oversight combined with round duties and maintenance needs.
STARTUP AND COMMISSIONING
PinnacleART provides startup and commissioning services for new facilities. Our team works in conjunction with contractors, operators and engineers to ensure that all assets and processes are functioning within specifications and performance envelopes as the facility comes online. We troubleshoot issues, handle performance testing, manage warranty and manufacturer issues and gather all original equipment manuals (OEM) and documentation.

TEMPORARY STAFFING
PinnacleART provides temporary staffing and staff augmentation for facilities unexpectedly lacking sufficient personnel. Our fully trained, experienced and certified operations staff can act as a supplement for short-term or long-term staffing needs.

TRAINING
PinnacleART provides operations and maintenance training for facilities seeking to improve the knowledge base of their staff. Our high-level operators and experienced engineers can train or retrain staff in process operations, operator math, and troubleshooting and root cause analysis to help your facility operate at its best.

TECHNOLOGY SOLUTIONS

CAD Miner™ (For Internal PinnacleART Use Only)
CADMiner™ is an AutoCAD™ interface that provides a static link to Microsoft Access™, and may be used to update and replace inspection drawing, circuitized P&ID and CMD drawing data, as well as guard against inconsistencies in a very streamlined and controlled fashion.

CIRCUITIZER™ (FOR INTERNAL PINNACLEART USE ONLY)
Circuitizer™ is an AutoCAD™ interface that enables the user to electronically identify and capture piping circuits on existing facility Piping and Instrumentation Diagrams (P&IDs). Once the circuits are captured in the program, the software can export a plant-wide circuit and line list that couples line numbers with their parent circuits, as well as the characteristics inherent in the line numbers.

CMD MAKER™ (FOR INTERNAL PINNACLEART USE ONLY)
CMD Maker™ is an AutoCAD™ interface that enables the user to electronically create Corrosion Model Diagrams (CMDs) that are linked to Corrosion Modeler™, based on existing facility Process Flow Diagrams (PFDs).

CMMS/EAM IMPLEMENTATION AND OPTIMIZATION
PinnacleART supports implementation of Computerized Maintenance Management Systems (CMMS) and/or Enterprise Asset Management (EAM) systems, as well as data clean up and/or updates to existing data. Maintenance recommendations and tasks identified during the Reliability Centered Maintenance analysis are fully developed and loaded into the system, along with necessary planning details such as materials and labor required.

CORROSION MODELER™ (FOR INTERNAL PINNACLEART USE ONLY)
Corrosion Modeler™ is a tool based on API 571 and other industry best practices that provides an unprecedented level of user interaction to create and leverage state-of-the-art corrosion models. The interface enables the user to create custom reports, add detail to existing process diagrams through AutoCAD and link with live data sources such as PI or ASPEN.
Dataminer™ (For Internal PinnacleART Use Only)
Dataminer Piping™ is a quality control tool that reconciles piping circuit, line number and TML information from a variety of piping sources, including isometric drawings, circuitized P&IDs and IDMS and RBI databases. It is driven by a systematic reconciliation process that highlights inconsistencies and facilitates revisions to the relevant data sources.

Dataminer Equipment™ is a user interface that directs the transfer of data from operator design documentation to electronic systems and provides a complex QA/QC routine that verifies the quality of the transfer. This application works to streamline and control the data extraction phase for PinnacleART’s engineers.

IDMS/RBI Software Conversion/Implementation
PinnacleART’s technical specialists are experts in Inspection Data Management System (IDMS) / Risk-Based Inspection (RBI) software implementation, conversion and evergreening training. From software configuration to management, PinnacleART ensures the expertise is provided to develop and maintain a successful program.

IDMS/RBI Software Selection Assessment
The purpose of PinnacleART’s Inspection Data Management System (IDMS) / Risk-Based Inspection (RBI) software assessment is to help clients make the right choice when selecting a IDMS or RBI software. Whether the facility or company is converting to a new software or buying a software for the first time, PinnacleART will facilitate a systematic process of identifying the functional requirements of the stakeholder team, critically weighing those requirements, and then showing how the mainstream industry software packages measure up to the weighted requirements.

ReliaBuilder© V8
PinnacleART’s ReliaBuilder© software is a Reliability Centered Maintenance (RCM) management tool. With a full suite of maintenance and reliability program elements linked with best practice topics, ReliaBuilder© provides an effective way to document and store your RCM data in one centralized location.

While the software facilitates PinnacleART’s Reliability Centered Maintenance studies, its focus is to provide certainty that the RCM analysis is properly performed and documented, providing a significant reduction in time and effort needed to document RCM data, while still maintaining the same amount of technical rigor.

Within ReliaBuilder©, facilities are able to build their asset list, mirroring the CMMS hierarchy; manage performance objectives and functions; clearly document the Failure Modes and Effects Analysis (FMEA) and define the criticality for each asset; create a customizable risk-ranking module; and quickly develop optimum mitigation strategies through custom inputs or by selecting from our intuitive built-in data resources. Additionally, after your RCM studies, ReliaBuilder© can be used as a tool to monitor and maintain an effective reliability program over time.

Sketch Packager™ (For Internal PinnacleART Use Only)
Sketch Packager™ is an AutoCAD™ interface that enables the user to create sketch, walkdown or inspection packets for piping circuits captured in Circuitizer™ at the touch of a button.
ABOUT PINNACLEART

PinnacleART’s vision is to make the world reliable, one customer at a time. We do this by designing, implementing, and maintaining comprehensive asset reliability and integrity programs for process facilities in the oil and gas, chemical, mining, pharmaceutical, wastewater, and electric power industries—including national oil companies, supermajors, and majors, as well as independents.

Our team of experts, engineers, and inspectors helps clients mitigate risk of downtime and loss of containment; ensure safety of personnel; optimize costs associated with inspection, maintenance and total asset spend; and ensure compliance with regulatory standards. PinnacleART’s expertise is multifaceted: mechanical integrity, reliability, inspection, technology, and project management. However, our truly unique skill set involves bringing all of these together to provide solutions that integrate people, processes, and technology.

ASSET PERFORMANCE MANAGEMENT

PinnacleART’s business model is based on Asset Performance Management (APM). All of our services and solutions fit into the APM cycle below.