

RMS Acquires AC Compressor from Baker Hughes, A GE Company

"Joining the RMS team feels like a homecoming for us and I couldn't be more excited. The combination of these strong organizations building upon the heritage of our product lines will result in superior service for our customers. I look forward to growing this business together!"

- Mark Koerner, 30+ years with ACC, GE and BHGE

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RMS Acquires AC Compressor

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Turbo Tunes

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RMS Acquires AC Compressor From Baker Hughes, A GE Company

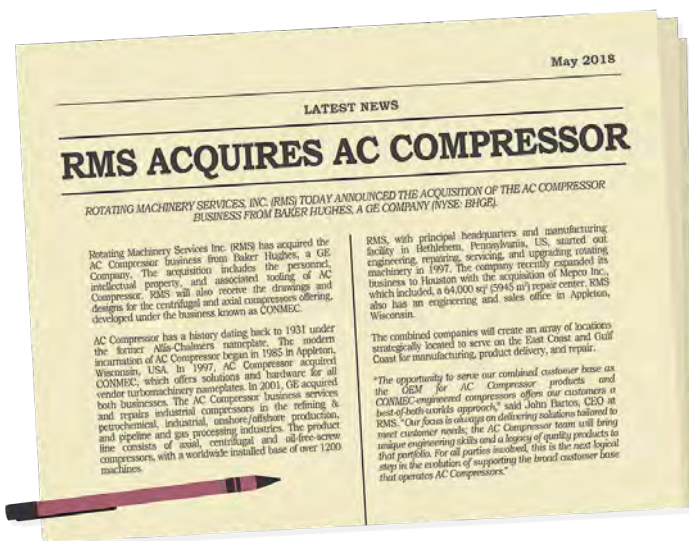
Rotating Machinery Services, Inc. (RMS) completed the acquisition of the AC Compressor business from Baker Hughes, a GE Company on May 4, 2018.

This acquisition brings the expert personnel, intellectual property and associated tooling of AC Compressor under the RMS umbrella in order to continue delivering the excellent customer service that the industry has come to expect from the brand. RMS will also receive the drawings and designs for the centrifugal and axial compressors offering, developed under the business known as CONMEC.

“The opportunity to serve our combined customer base as the OEM for AC Compressor products and CONMEC-engineered compressors offers our customers a best-of-both-worlds approach,” said John Bartos, CEO at RMS. “Our focus is always on delivering solutions tailored to meet customer needs; the AC Compressor team will bring unique engineering skills and a legacy of quality products to that portfolio. For all parties involved, this is the next logical step in the evolution of supporting the broad customer base that operates AC Compressors.”

In 2017 RMS acquired the Mepco business in Houston, TX. Prior to the acquisition, RMS had a portfolio that consisted of engineered solutions for compressors, expanders, and turbines. “The Mepco shop in Houston has a well-earned reputation for responsive service and one of the highest quality ratings in the industry,” said Dirk Paraschos, Vice President of Operations, Houston. “The addition of AC Compressor and CONMEC expertise augments and reinforces our existing portfolio, while expanding our product range to cover even more markets, including internationally where AC Compressor has strong representative partnerships.”

The combined footprint will create an array of locations strategically located to serve high-demand, quick-turnaround markets on the East Coast and Gulf Coast for manufacturing, product delivery and repair. “There is a lot of mutual history within these companies,” said Bartos. “Even prior to the acquisition, current RMS personnel clocked over 485 years of experience within CONMEC and 120 years within AC Compressor. In a way, it’s sort of a homecoming combining these three great entities.”





These gentlemen are used to wearing many hats, but they're happy to be back to some of their original ones to represent this historic occasion.

Left to Right: Rick Meyers, ACC longest-serving employee; Jerry Hallman, RMS co-founder; George Donald, CONMEC co-founder

The current acquisition by RMS of the ACC centrifugal compressor product line is very dynamic, the product line has a long successful history and to date is operational with many customers who are very content with the product line. The reconnection with customers from technical stand point will very beneficial to RMS and beneficial to the customer support bringing total technical support.

Rick Meyers is currently working as a Senior Engineer Design Management for BHGE, and is the longest serving member of the AC Compressor team with more than 30 years of experience.

It really has been a very exciting journey starting with CONMEC in 1988 and being a co-founder of RMS in 1998. To be reunited with CONMEC / AC Compressor professionals is the logical next chapter - and I know it can only strengthen the turbomachinery industry.

Jerry Hallman is currently the Commercial Director for RMS. He has also held the position of President, and is one of the three original founders of the organization. His career started at Ingersoll-Rand Turbo Division as the Purchasing Director.

For me personally, this is the rebirth of CONMEC. I have been humbled by the faith expressed to me by our customers and former employees. For RMS to be able to serve these customers is an exciting opportunity. We have had a significant impact on the turbomachinery market and I'm pleased that we will be able to continue that tradition.

George H. Donald is currently the Technical Director for Centrifugal Compressor Development at RMS. He is one of the founding members of CONMEC and brings with him an unparalleled wealth of experience in the industry.

Refinery Axial Compressor Shop Overhaul and Rerate

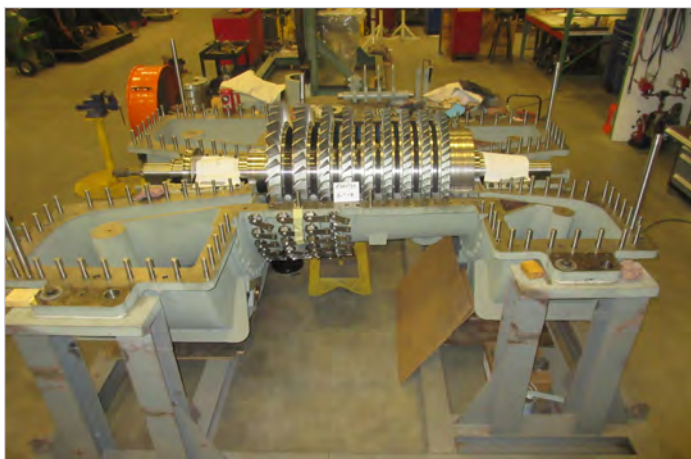
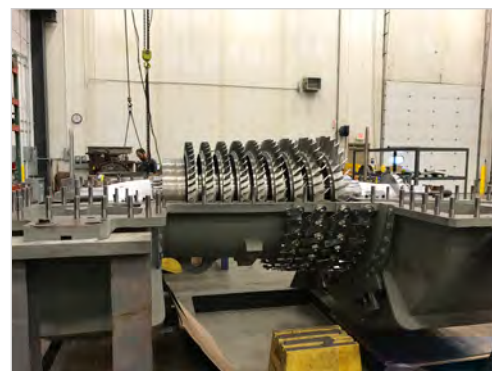
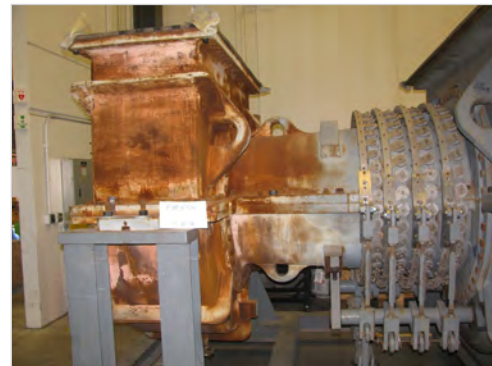
Eric Dunlap, Senior Engineer

RMS was recently contracted to inspect and overhaul an axial compressor used as the main air blower in a FCC Unit at a Texas refinery. We started the project by providing on-site labor supervision for the Fluid Catalytic Cracking (FCC) train turnaround in which the entire compressor was removed from the machinery deck and replaced with the customer's spare.

Following the turnaround, the compressor was shipped to the RMS service center in Bethlehem, PA for a complete disassembly and Phase II inspection. The results of the inspection were documented in an inspection report and presented to the customer with a recommended repair work scope, which included a **new shaft, two new rotor discs, new bearing housings, all new variable stator vanes, new casing hardware, and a partial new rotor blade set**. All of the remaining components were repaired as required to function reliably for another service campaign.

The requirement that two rotor discs be retired and replaced with new discs allowed the customer and RMS an opportunity to respond to the refinery's need for increased air flow from the compressor. By redesigning the discs and rotor blades in these stages, RMS aerodynamic analysis predicts a **4% increase in compressor flow capacity** will be achieved.

The refurbished compressor is currently being re-assembled in our Bethlehem, PA service center. Once all quality checks and critical machine clearances are verified and recorded the compressor will be preserved and shipped to the customer's storage facility, ready to be installed and provide another long-term reliable operating campaign.



Refinery Axial Compressor Rotor and Stationary Components Inspection and Repair

Behzad Abdollahi, Design Engineer II

RMS was contracted to inspect and overhaul an axial compressor which is used as the main air blower in a Fluid Catalytic Cracking (FCC) Unit at a Louisiana refinery. To begin, we fully disassembled and thoroughly inspected the stationary and rotating components.

The condition was documented and sent to the customer with a recommended repair scope. After approval, we executed the extensive engineering and repairs that were necessary to ensure a reliable compressor overhaul.

During inspections, many components were found to be in critical condition and needed to either be repaired or replaced.

Severe foreign object damage required **full rotor blade replacement necessitating thorough structural and vibratory analyses**. Repairs also included rework of thrust collar, impeller, and balance piston hubs. Following rework and assembly, the entire rotor was coated and balanced at operating speed.

The stationary components repair included **full replacement of casing hardware, variable stator vane assembly wear parts, along with most of the variable stator vanes, fixed stators and seals, and inner shroud ring seals**. The cracks that were found in the casing during visual and NDT inspections were weld repaired.

A 250-page quality dossier was delivered to the customer, consisting of measured tip clearances, assembly drawings, and inspections reports. The rotor and stationary components were long-term preserved and shipped back to customer.



RMS First Quarter Steam Turbine Turnarounds

Sydney Gross, Director, Steam Turbine Engineering

Between February and March, RMS executed **three overlapping steam turbine turnarounds**. Each of the turnarounds included modifications to the machines that were planned in advance for incorporation into the overhaul scope.

All three units were delivered on schedule, started and ran successfully. While other shops can perform routine turnaround services, RMS delivers full design capability to engineer and implement modifications on a wide range of manufacturers and models. RMS has the experience and technology to modify or redesign any turbine component to meet our customers' needs.



The first machine to arrive was a refinery main air blower turbine. It was a 1950s vintage I-R 8 stage non-condensing turbine. In addition to the standard disassembly, clean and inspect (DCI) scope, RMS executed the following work:

- Line bored the casing to eliminate steam leakage and repair groove cutting
- Installed new shaft and bearing designs to upgrade thrust capacity and rotor dynamic response
- Shaft and bearing housing was modified and a tool designed for turning the rotor without lifting the bearing housing cover saving hours of time during start up
- Additional oil baffles were designed and installed to eliminate nuisance oil leaks



In less than a week the second machine had arrived. This refinery Propylene compressor turbine driver was manufactured by Westinghouse Canada in the 1970s and uprated by CONMEC in the 1990s. RMS performed the DCI along with the following scope:

- Installed an upgraded thrust bearing to reduce bearing temperature and allow higher throughput
- Modified the support of governor drive oil feed system to prevent loosening from operational vibration



Within days the third machine, an Alky refrigeration compressor driver, was delivered ahead of schedule. It was a three-stage Elliott turbine manufactured in the 1950s with a work scope of upgrading the controls to electronics along with the overhaul. The controls upgrade scope included:

- Significant modification to the thrust bearing housing to accommodate speed sensors and eliminate oil porting
- Modification of the rotor for speed sensing wheel

Vaned vs. Vaneless Diffusor in Compressor Stages

Ryan Montero, Lead Aerodynamicist

When designing a centrifugal compressor stage the choice in diffusor design must be considered in clean sheet designs and rerate cases. In general, these diffusors fall into two categories: vaned and vaneless.

The job of the diffusor section of a stage is to convert the dynamic pressure (velocity head) coming out of the impeller into static pressure. The velocity will be reduced going into the crossover bend, or volute depending on the stage, reducing the amount of loss taken going into the final sections of the stage. The diffusion done in a vaneless space is primarily done through area increase as the flow goes radially outward. For a given diffusor width, as the radius increases so will the area. A vaned diffusor can achieve diffusion in two ways; through the increase in area as radius increases and through use of diffusion over the vane. The vane acts as a diffusing agent itself through the pressure field created on the airfoil surface.

Diffusors can also be designed to aid in surge avoidance. As the flow in a stage decreases, the area increase in a vaneless space becomes more of a hindrance than a benefit; and as the flow angle decreases below a stable value the flow in the diffusor can reverse and surge can occur. Vaneless diffusors can be “pinched”, meaning the diffusor width decreases with radius, in order to attempt to avoid this. The issue with this is of course that the area increase that the diffusor depends on may not exist depending on the severity of the pinch required. Vaned diffusors can tune diffusor angles to turn the flow for increasing angle to avoid surge. In this way the vaned spaces still get the diffusion of the area increase and vane diffusion, all while helping to create head margin to surge. **Figure 1** shows a vaned and vaneless diffusor tuned to create similar curve shape and head margin to surge, these diffusors follow identical impellers. In this case the vaneless diffusor is pinched to create the same head margin as the vaned diffusor. Notice how the static pressure is higher at the exit of the vaned diffusor where adequate diffusion has taken place.

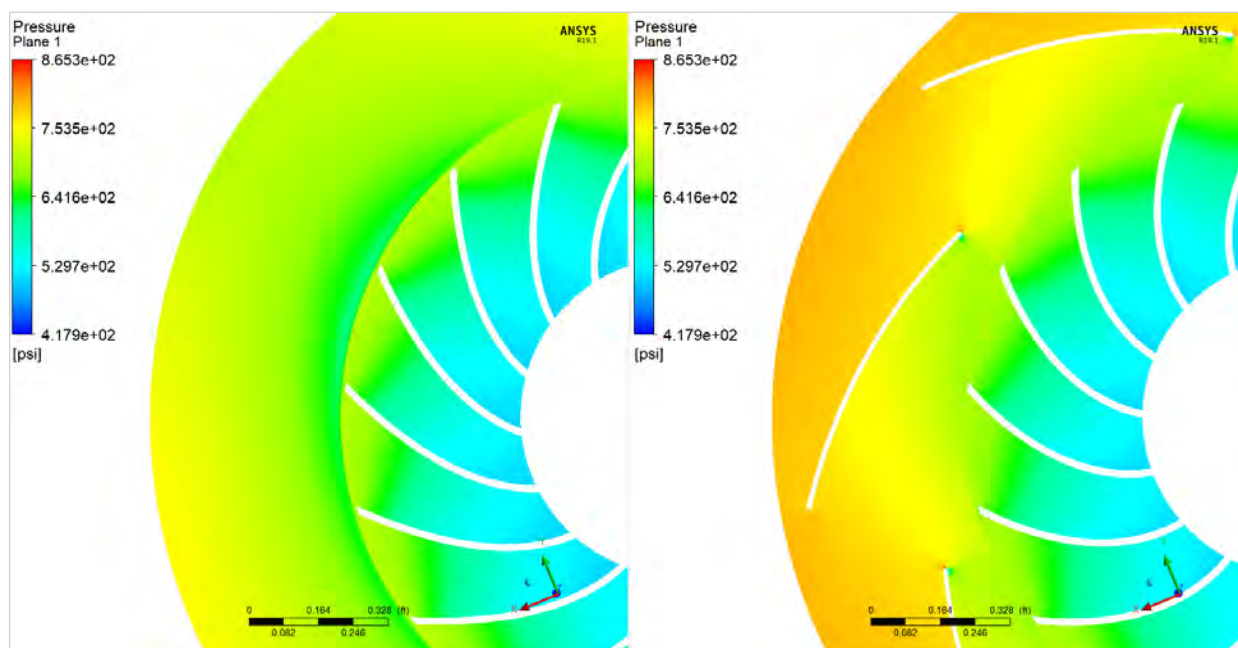


Figure 1: Pressure distributions determined by CFD results for vaned (right) and vaneless (left) diffusors designed for similar impellers/stages

Both vaned and vaneless diffuser designs have benefits and drawbacks to their implementation.

Vaneless Diffusor

- Better flow range
- Better performance off design
- Reduces aeroacoustic effects of pressure pulsations from impeller

Vaned Diffusor

- Better performance near design point
- Lower velocity going into discharge volute
- Higher efficiency

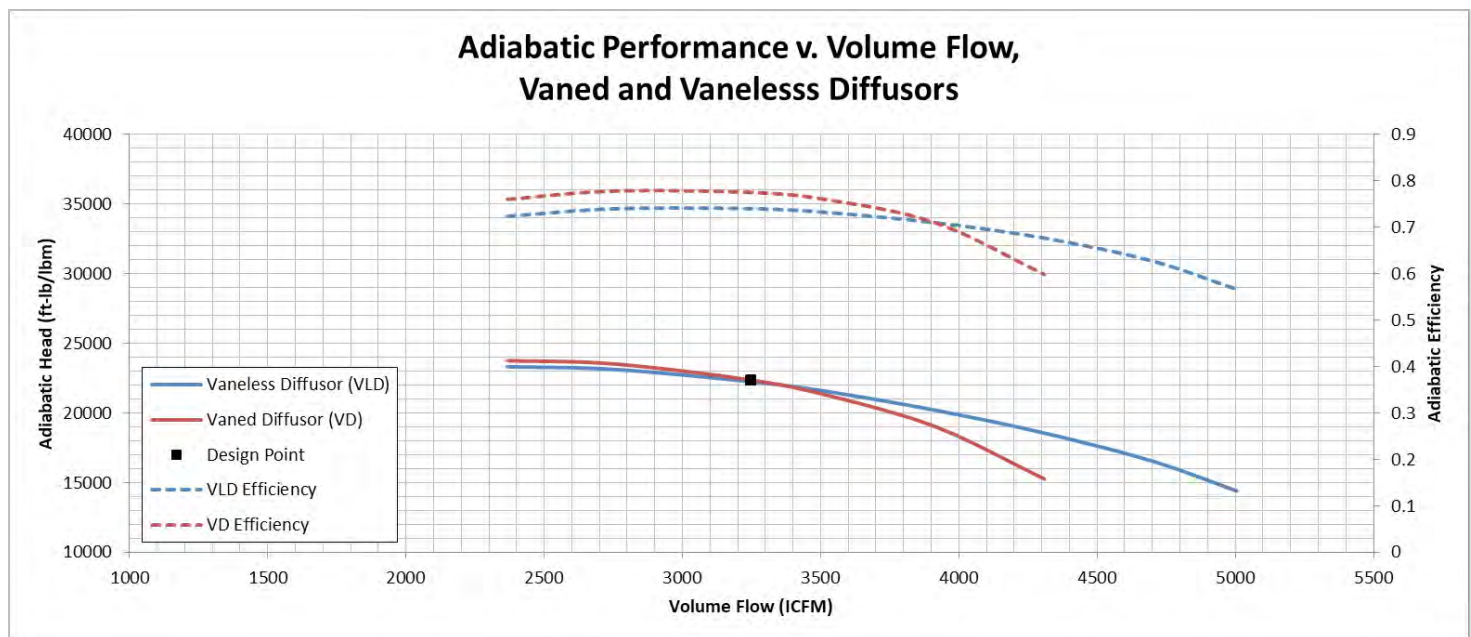


Figure 2: Performance curves for stages designed for the same operating point with vaned and vaneless diffuser designs

Figure 2 illustrates this by directly comparing head and efficiency curves for similar stages with both vaned and vaneless diffusers. As anticipated, the vaneless diffuser curve is slightly less efficient near the design point, but the compressor has a greater operating range and has more sustained performance off-design. The vaneless by comparison has shorter range, but is more efficient at the design point. This makes **vaned diffusers a better choice where the user anticipates narrow flow ranges during operation**, where the compressor can be kept near the design point and can leverage these efficiency benefits of the vaned diffuser.

AC Compressor Control Panel Upgrades

Albenis Hernández, Principal Controls Engineer

AC compressors fleet have been used in different industry sectors and applications. Among the used equipment are the single stage, multistage, and oil free compressors. Many of the turbomachinery packages have instrumentation/ control systems that can be over 30 years old. In some of the panels, the control, alarming, and shutdown capabilities are performed by a relay based control system, outdated controllers, and other obsolete instrumentation that constitutes a reliability risk for plant operations.

Although the relay/controllers systems are operational, at times the customer is in a bad position due to the availability or lack of spare parts (relays, electronic cards etc.) that are no longer supported by RMS and OEM's. This increases the time between failures, and decreases reliability affecting the customer's bottom line by loss of production.



RMS is pleased to offer an alternative to modernize the turbocompressors controls system. The offering comprises a complete upgrade of the relay board and accessories to a Programmable Automation controller (PAC) solution (formerly PLC) and the addition of a Human Machine Interface (HMI) and other accessories that will result in less systems failures, and avoid long-term outages due to inaccessible spare parts. Please consider RMS as the next step for your turbomachinery controls needs.



In general, the benefits translate to modernization, enhancing performance, and improving the reliability of the control system.

- Newer, updated technology, PAC/PLC-HMI based
- State-of-the-art software plus first out, alarms, permissive, trips, process screens
- Available upgrades for machine monitoring systems, overspeed systems, etc
- Fully tested before shipment
- Lower downtime for troubleshooting- Increase productivity
- Obsolescence avoidance

The RMS Family Grows

Please join us in welcoming the newest RMS team members!

Mark Koerner • Vice President, AC Compressor Products

Mark joins RMS with 30 years' experience working in the AC Compressor business, which for the last 17 years has been a part of GE Oil & Gas/BHGE.

William Febres • Director of International Sales

William joins RMS with 15 years of oil & gas experience for which 10 years have been with GE Oil & Gas/BHGE. His past roles included Field Services Manager, Project Manager, Commercial Manager and Commercial Director for the AC and Conmec Compressor Product lines.

Jonathan Calhoun • Regional Sales Manager

Jonathan joins RMS with more than 26 years' experience working as a business sales leader focused on delivering the right products and technology to customers through a collaborative quality oriented approach.

Nicolas Schneider • Regional Sales Manager

Nick joins RMS with 9 years' experience leveraging technical experience to support direct customer sales for upgrades and services on existing rotating equipment in North America.

Joe Faron • Regional Sales Manager

Joe joins RMS with 23 years of turbomachinery sales experience. He began his career at Ford Motor Company, before his roles as Project Engineer, Project Manager and Corporate Quality Manager for an engineered systems supplier to the power industry.

Barry Nicholson • QC Manager, Houston

Barry's extensive background includes implementation of quality programs from beginning to end and all types of quality dossiers/document control programs. He is both an ASQ-Certified Quality Auditor and Manager of Quality/Organizational Excellence.

Adam Hernandez • Product Manager, Oil Free Screw Compressors

Adam joins RMS with 13 years' experience working in the turbomachinery industry, the last 6 years of which has been with the AC Compressor business, as a part of GE Oil & Gas/BHGE.

Dan Meyer • Manager of Analytics & Engineering Systems

Dan joins RMS after 3 years as the Director of Operational Support, Engineering Systems, with the Cameron Group of Schlumberger. Previously, he had 14 years with Precision Cast Components and Cameron Valves & Measurement in Director-level positions before progressing to a corporate leadership role.

Tariq Harris • Lead Engineer, ACC Products

Tariq joins RMS with 20 years' experience in engineering analysis, repair development, project performance and working in cross-functioning teams. Tariq has worked for the last two years within the O&G Turbomachinery Process Solutions, as a part of GE Oil & Gas/BHGE.

Akshay Bharadwaj • Engineering Systems Lead

Akshay joins RMS with 10+ years' experience working in areas of manufacturing, design and services industries. He has held various roles, including Production Engineer, Lead Manufacturing Engineer, Equipment Engineer, and most recently Engineering Process Leader.

Yunbae Kim • Principal Aerodynamic Engineer

Yunbae joins RMS with 20+ years of industrial experience. Yunbae earned a Master of Science in Mechanical Engineering and a Ph.D. in Mechanical Engineering from Michigan State University.

Albenis Hernandez • Principal Controls Engineer

Albenis brings 18+ years of experience in electrical and control systems design for oil & gas turbomachinery, equipment and automation.

The RMS Family Grows

Please join us in welcoming the newest RMS team members!

David Morehouse • Principal Applications Engineer

David joins RMS with more than 22 years' experience working in the turbomachinery business. David's most recent position was with GE (AC Compressor) as Application Engineer, Marketing Program Manager, Technical Sales Manager, Product Manager, and Platform Manager.

Colleen Rimlinger • Principal Applications Engineer

Colleen joins RMS with 30 years' experience working in the oil & gas and power generation field with extensive knowledge of industrial gas turbine engines, centrifugal compressor and generator equipment.

Richard Meyers • Senior Systems Design Engineer

Richard joins RMS with 31+ years of experience. Richard has held roles of increasing responsibility including Project Engineer, Senior Engineer Design Management, and most recently Product Service Engineer.

Esat Yenigun • Senior Engineer

Esat joins RMS with 18 years' experience working in the turbomachinery industry. Esat has worked for the last 3 years within the AC Compressor business, as a part of GE Oil & Gas/BHGE.

James Akinade • Senior Engineer

James joins RMS with more than 12 years' experience working in operational planning, product development, risk management, project management and process improvement.

Andrew Whicker • Senior Engineer

Andrew joins RMS with 11 years' experience developing accurate repair recommendations based on customer cost and time requirement for multiple product lines: centrifugal, oil free screw and bladed compressors.

Richard Dutko • Senior CAD Designer

Richard joins RMS with 17 years of engineering experience within the oil & gas and automotive industries. Richard has held roles of increasing responsibility, including most recently Senior CAD Designer.

Ryan Rohloff • CAD Designer

Ryan joins RMS with 22 years of mechanical design experience, 11 of which are with AC Compressor/GE Oil & Gas. Ryan has worked the last three years on environmental control technologies with B&W Megtec.

Ricky Gonzalez • Senior Engineered Order Staff Manager

Ricky joins RMS with over 34 years' experience working in overall project execution and project management.

Jose Ortiz • Principal Engineered Order Manager

Jose joins RMS with more than 26 years' experience working in project management, Supplier Quality Engineering Manufacturing management, Process Improvement among other disciplines.

Suzanne Ellison • Lead Engineered Order Manager

Suzanne joins RMS with over 25 years' experience working in project management, manufacturing engineering and process improvement. Most recently, Suzanne fulfilled the role of Process Improvement Leader.

Mike Brown • Lead Engineered Order Manager

Mike joins RMS with 15 years' experience working in oil and gas project management, operations management and controllership. Mark has held roles of increasing responsibility including, most recently, Lead Services Project Manager.

James Klemme • Senior Engineered Order Scheduler

James joins RMS with more than 18 years' experience working in project planning and execution, process improvement, operations management and team development.

Doug Bocek • Lead Proposal Specialist

Doug joins RMS with more than 39 years' experience working in the various industries and the turbomachinery business. Doug started with the US Air Force as a Project Manager, attaining the rank of Captain before moving on to various engineering positions, most recently with GE/BHGE.

Laura Assante • Lead Proposals Specialist

Laura joins RMS after 11 years' experience working in GE Oil & Gas. She moved to Houston with her family in 2014 where she joined the Rotoflow and AC Compressor team covering roles including Project Controller, Cost Analyst and Commercial Proposal Manager.

Maria Frias • Lead Proposal Specialist

Maria joins RMS with 7 years' experience working in the AC Compressor business, which for the last four years has been a part of GE Oil & Gas/BHGE.

Carlos Correa • Lead Proposals Specialist

Carlos has 5 years' experience working in the GE Oil & Gas/BHGE AC Compressor and Rotoflow turboexpanders business, with responsibility for the development of proposals related to spare parts, inspections and repairs.

Alberto Shedid • Lead Purchasing Agent

Alberto joins RMS with 25 years' experience working in the turbomachinery industry. Alberto has worked for the last 13 years within the AC Compressor business, as a part of GE Oil & Gas/BHGE.

Dieudonne Mananga • Lead Purchasing Agent

Dieudonne joins RMS with 30 years' experience developing and implementing commodity strategies, building calculated and tactical agreements and identifying great suppliers.

Evelyn Benitez • Commercial Analyst

Evelyn joins us from BHGE. She worked 22 years in the Food Manufacturing Industry and brings with her three years experience in the Mining/Metal Industry as a Commercial Analyst for the Latin American Division.

Jonathan Flores • Senior HR Specialist

Jonathan's past roles include HR and Recruitment Lead. He brings with him experience in strategic planning, on-boarding, staff recruitment and retention, performance management, employee orientation and development, employee relations, as well as accounting experience.

Carol Hannon • Senior AP Professional

Carol joins the RMS Team with 20+ years of experience in the Accounting field. Throughout her career, she has held roles as Controller, Sr. Staff Accountant, AP Specialist and Accounting Supervisor.

Peter Pagano • Senior Staff Accountant

Peter joins the RMS Team with more than 28 years in the financial industry, serving the technology and pharmaceutical industries. His past roles include Financial Manager, Budget & Cost Manager, as well as Senior Financial Analyst.

Jeffrey Frasier • Field Service Technician

Jeff joins RMS with more than 30 years' experience in oil & gas working on installation and maintenance projects specializing in centrifugal compressors, steam turbines and axial compressors at various refineries and ethylene plants.

Cindy Kaiser • Administrative Assistant

Cindy comes to RMS with more than 29 years' experience in customer service. Her most recent role was Accounting/Producer Payroll for Readington Farms.

The RMS Family Grows

The RMS South Houston, TX and Bethlehem, PA Facilities are excited to welcome to the team:

Shannan Carlock

Eric Grissom

Ricardo Gonzalez

Abrisio Perez

Rene Vazquez

David Hopkins

Jose Fonseca

Michael Heidger

Gabriel Salazar

Tim Ehasz

Kishan Agravat

John Patton

James Nicholson

Steven Patterson

Join the RMS Team!

We currently have the following positions open at RMS.

RMS Main Office – Bethlehem, PA

- Shop Manager
- Rotor Assembly Mechanic
- IT Specialist
- Compressor Engineer I or II

RMS Mepco – South Houston, TX

- Global Logistics Specialist
- Welder
- Sr. Mechanics and Mechanics
- Utility Person

RMS Northchase – North Houston, TX

- Senior Administrative Assistant / Office Coordinator
- Engineering Technical Coordinator

To apply, please send your resume (Attn: Human Resources) to:

HR@rotatingmachinery.com

or

2760 Baglyos Circle, Bethlehem, PA 18020

Turbo Toons by RMS's own Marc Rubino, Principal Engineer





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Centrifugal & Oil Free Screw
Compressors, Parts & Service

Compressor **CONMEC**

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**Axial Compressors • Centrifugal Compressors
Gas Turbines • Steam Turbines • Power Turbines
FCC Expanders • Nitric Acid Expanders • Oil Free Screws**

- Field Services
- Analytical Evaluations
- Dynamic Balancing
- Machinery Installation,
Redesign, Repair,
Commissioning, Overhaul, and
Rerates
- Reverse Engineering
- Third-Party Inspection
- Consulting
- Orphan Equipment
- Labor and Labor Supervision
- Spare Assemblies and
Components
- Remaining Life Assessments
- Design Engineering
- Surplus Equipment
Rejuvenation

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