Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Small Business

Flexware® Products and Services
Maximize Efficiency, Capacity & Reliability

AWM

TRAINING

SOFTWARE

TURBOMACHINERY PARTS

ENGINEERING SERVICES

Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Company

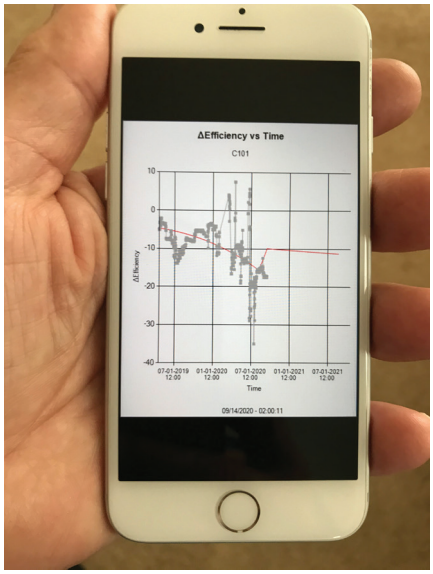
AWM

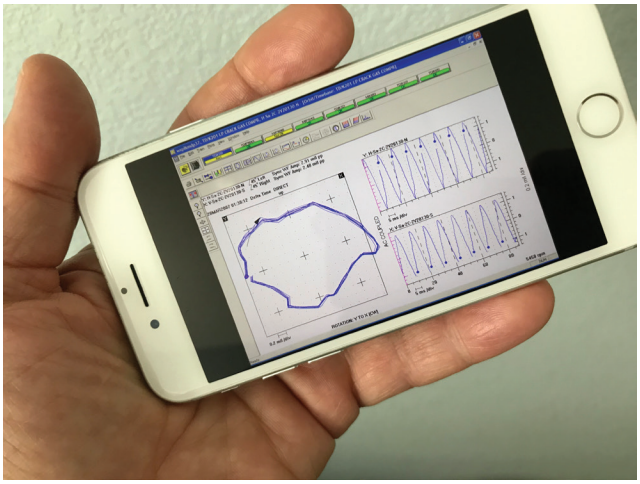
"Asset Web Monitor"

Compressors – Steam Turbines – Gas Turbines

Quick Check on Data Accuracy	✓
BWR Equations of State	✓
English & SI Units	✓
Compressor Maps	✓
Trend & Forecast Plots	✓
Δ Efficiency vs. Time	✓
Speak with a Flexware Rot Eqp Engineer or Aerodynamicists N/C	✓

Alerts – Warnings - Alarms	✓
Diagnostics	✓
Spectra Analysis	✓
Waveform Analysis	✓
Trend Plots	✓
Orbits	✓
Best Cost/Benefit Ratio	✓
Emails with Alarms	✓





Δ Efficiency vs. time is the best & easiest way to monitor compressor health and plan for maintenance.

A quick check of the Δ work input gives you the accuracy of the data being collected that is used in the performance calculations. The software can also be installed on a server on the network of the plant (on premise) or can run in the cloud. The storage capability is also very high. Flexware offers a wide variety of service (periodic reporting, reporting based on alarms, instrumentation tests, and more).

AWM can do state-dependent vibration monitoring (slow roll, run-up, coast-down, running, low load, high load, etc.). It can also measure vibration trends, orbits, spectra, waterfalls, peak/phase plots, etc., so all the graphs required to analyze a turbomachine are available. The software can also be installed on a server on the network of the plant (on premise) or can run in the cloud. The storage capability is also very high. Flexware offers a wide variety of service (periodic reporting, reporting based on alarms, instrumentation tests, and more).

Monitor it all at the touch of a finger!

Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com

Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Small Buiness

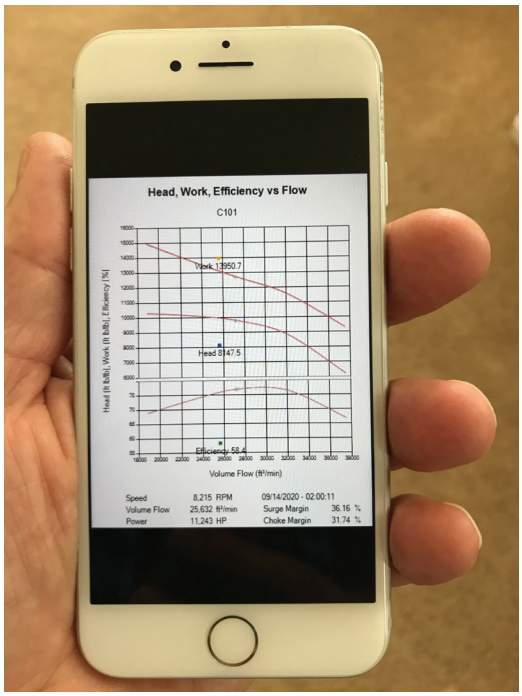
Flexware® Software

Flex Live® Online Field Performance Monitoring

- *Maximize plant capacity and minimize costs through condition based maintenance*
  - *Cleaning/washing compressors & turbines*
  - *Evaluate needs/timing for overhaul*
  - *Maintain maximum plant capacity*
  - *Immediately confirm effectiveness of overhaul or rerate*
- *Confirm OEM guaranteed performance*
- *Avoid choke and surge areas*
- *Aid in plant debottlenecking*
- *Aid in root cause analysis of compressor & turbine problems*

- **Monitor Equipment Efficiency**
- **Avoid Choke & Surge**
- **Debottlenecking**
- **BWR Accuracy**
- **Confirm the Need for Maintenance**
- **Confirm Maintenance Corrected Problem**
- **"At a Glance" PTC-10 Quality Analysis**
- **Operating Point on OEM Curve**
- **Confirm OEM Guarantees for:**
  - **New Equipment**
  - **Upgrades and Rerates**
- **Trend Data vs. Time**

Equipment operating data is processed and results are compared to the OEM performance curve and trended over time. Differential values like the difference in actual operating efficiency compared to the OEM predicted efficiency can be monitored on a time trending basis.



Compressors – Turbines

Flexware's rotating equipment engineers and aerodynamicists are available to assist with analysis and troubleshooting at no extra charge via. email or phone and quickly available to travel to site at reasonable rates.

Monitor it all at the touch of a finger!

Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com

Flexware®

Turbomachinery Engineers

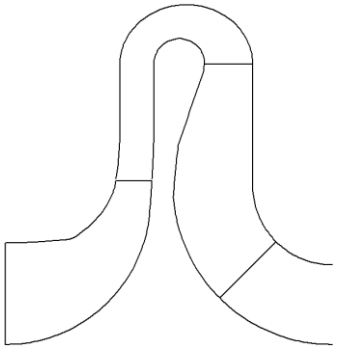
A Veteran & Employee Owned Small Buiness

CompAero & TurbAero

Centrifugal and Axial Compressor and Turbine Axial-Flow and Radial-Inflow Aerodynamic Design & Analysis Software

Aerodynamic Design:

- Individual stages
- Straight through compressors & turbines
- Iso-cooled compressors
- Sidestream compressors
- Condensing turbines
- Extraction turbines

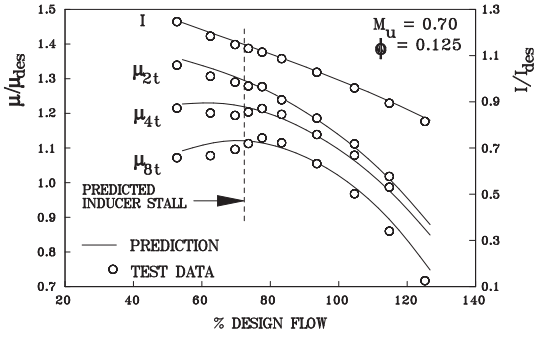


Stage Design

A high flow stage designed using CompAero. Flow coefficient 0.136, Mach # 0.88 and vaneless diffuser ratio of 1.48.

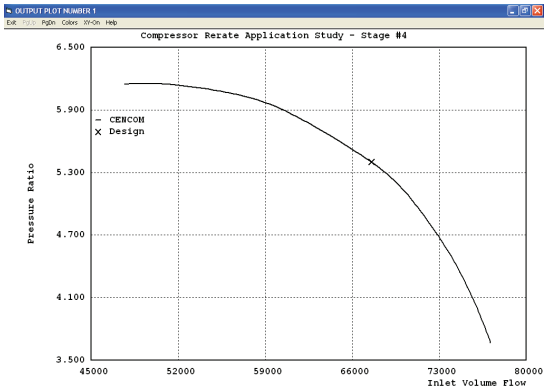
Accurate Results

Proven design methods used over the past 30 years provide accurate results.

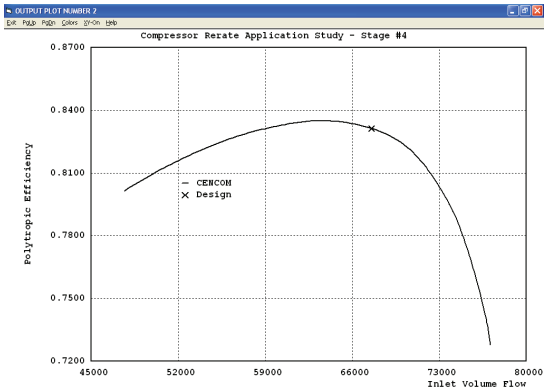


Aerodynamic Modeling:

- Estimate new equipment
- Rerate for new conditions
- Confirm performance
- Design new components
- Plot predicted curves for old machinery
- Troubleshoot aero problems
- Model “what if” scenarios



Pressure Ratio vs. Inlet Flow



Efficiency vs. Inlet Flow

Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com

Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Small Buiness

Flexware® Turbomachinery Training Programs

Call us about our training seminars. With our years of experience in turbomachinery training Flexware® and can provide you with a quality program that suits your needs. These seminars are for operators, engineers and technicians interested in compressors, gas turbines and steam turbine performance and condition based maintenance.

Turbine & Compressor Practical Guidelines

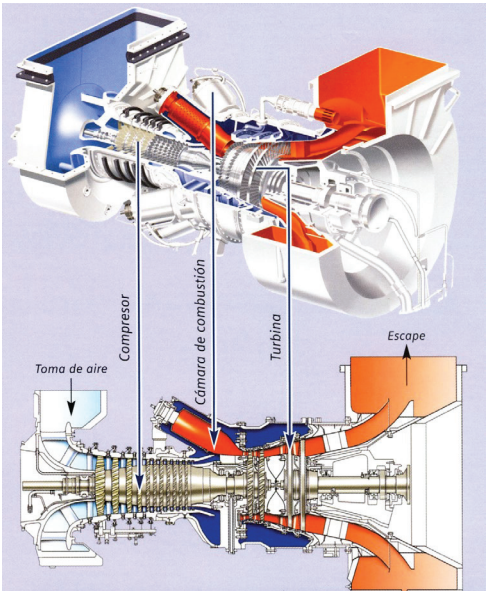
This seminar is for operators, maintenance, engineering and supervisory personnel responsible for operation and maintenance of centrifugal compressors, gas turbines & steam turbines.

- Aerodynamic components
- Performance monitoring
- Vibration and rotordynamics
- Rotor Stability
- Bearings & seals.
- Modernization strategies
- Startup & operation

Turbomachinery Performance Seminar

This seminar is for operators, engineers and technicians interested in compressor, gas turbine and steam turbine performance and condition based maintenance.

- Aerodynamics & Thermodynamics
- Compressor characteristics
- Field testing
- Troubleshooting
- Operation



Couplings and Alignment

A program on alignment of equipment & couplings.

- Types of couplings
- Coupling installation
- Equipment alignment

Gas Turbines

- Aerodynamic components
- Troubleshooting
- Inspection
- Condition based maintenance
- Operation

Customized Program

Let us quote you a price to conduct a customized training program at your facility. We can design a program to fit your needs and specifically address your situation.

Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com

Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Small Buiness

Maximize Turbomachinery Efficiency, Capacity and Reliability

Flexware® can review your compressor, gas turbine and steam turbine efficiency.

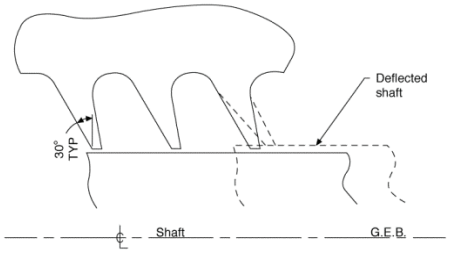
Field Performance Analysis

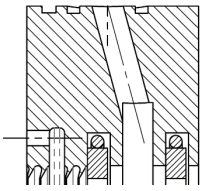
A field performance test will tell you exactly where the equipment is operating on the OEM performance curve and provide the opportunities for maximizing utilization of your equipment.

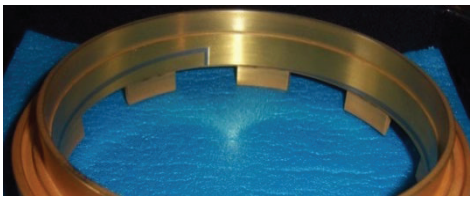
Maintenance Scheduling

Knowing the performance of your equipment will aid in scheduling maintenance and save downtime.

- Turnaround scheduling
- Cleaning equipment internals
- Troubleshooting problems



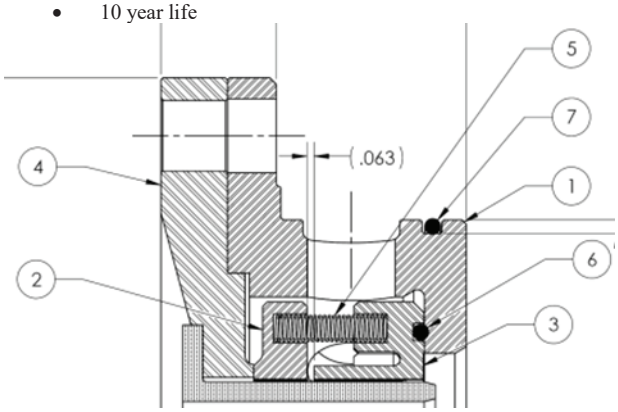




Sleeve Seals

Improve seal life and contaminated leakage with Flexware® Tri-Metal sleeve seals

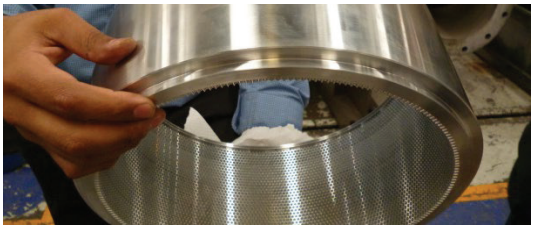
- Custom fit to existing cavity
- Cartridge design or replacement seal rings.
- Low price
- 10 gal/day/seal max. cont. leakage
- 10 year life



Internal Seals

Small efficiency improvements can be made by upgrading internal seals.

- Fluorosint
- Honeycomb
- Rub tolerant
- Hole pattern damper seals
- Carbon ring seals



Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com

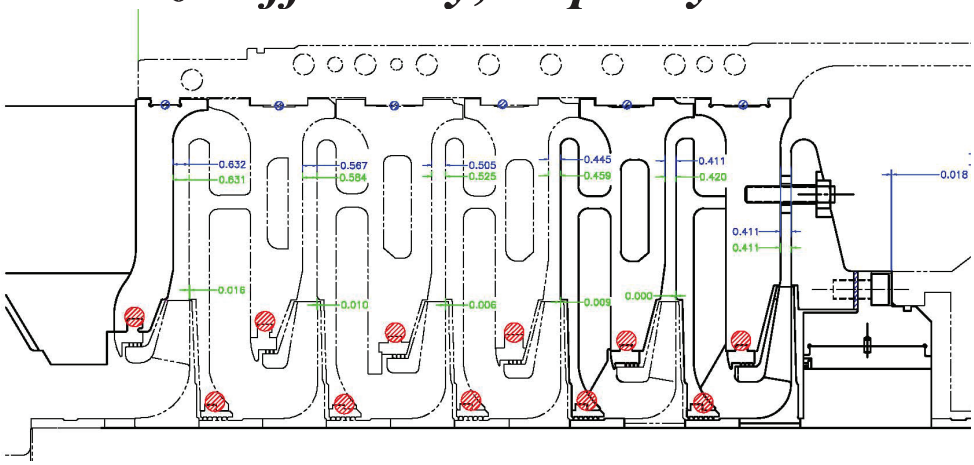
Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Small Buiness

Flexware® Rerates

Maximize Efficiency, Capacity & Reliability



Rerate Compressors and Turbines for New Conditions

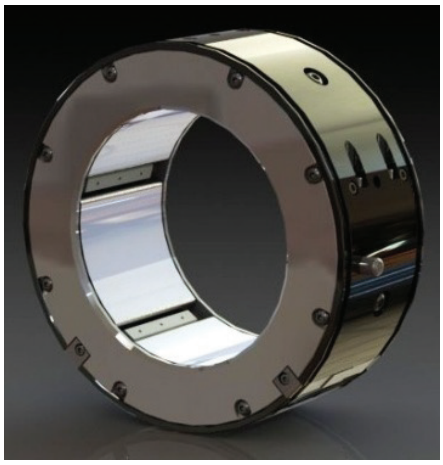
Increase efficiency, capacity & pressure rise or accommodate for other process condition changes:

- Rerate (new redesigned impellers, blades and diaphragms)
- Performance curve for new conditions – gas, pressure, temperature or speed
- Internal seal changes
- Generate performance curve for old machines

Efficiency, Capacity & Head

Increase efficiency, capacity & pressure rise by:

- Speed increases
- Internal seal changes
- Rerate (new modern impellers & blading design, diaphragms & interstage seals)



Damper Bearings

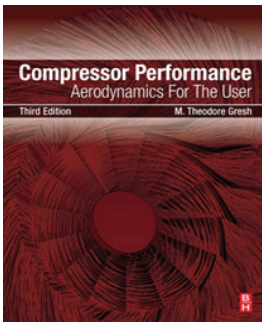
Flexware can resolve your vibration problems with rotor stability analysis and replacement damper bearings.

Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com

Flexware®

Turbomachinery Engineers

A Veteran & Employee Owned Small Buiness

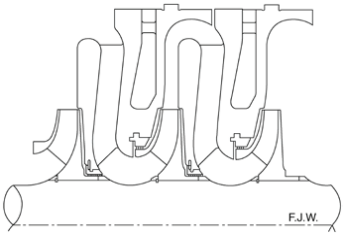


AWM
TRAINING
SOFTWARE

TURBOMACHINERY PARTS
ENGINEERING SERVICES

Flexware®

Customers



MECO
MARATHON
ارامكو السعودية
Saudi Aramco
FLINT HILLS resources
AV AEROSPACE
SPACEX
DRESSER-RAND
Bringing energy and the environment into harmony.®
PERTAMINA
KOCH INDUSTRIES INC.
Williams
سابك
sabic
راس غاز
RG
RasGas
TOTAL
Syncrude
ExxonMobil
SUNOCO
sherritt
MOTIVA ENTERPRISES LLC
قافكو
QAFCO
QATAR FERTILISER COMPANY
lyondellbasell
PETROLOGISTICS
ELLIOTT GROUP
EBARA CORPORATION
NOVA Chemicals
ptt
GLOBAL CHEMICAL
PRAXAIR
Making our planet more productive
PETRO-CANADA
john crane
a smiths company
FOSTER WHEELER
Celanese
DOW
Great Plains
SYNFUELS
DAKOTA GASIFICATION COMPANY
THE LINDE GROUP
Linde
bp
JGC
Voices for Energy
VALERO

Flexware, Inc, PO Box 110, Grapeville, PA 15634 USA, 1-724-493-7906, sales@flexwareinc.com www.flexwareinc.com