

# COMPRESSOR TRAINING SEMINAR

## "TURBOCOMPRESSORS – Practical Guidelines"

Online Performance Monitoring, Buffer Systems, Rotordynamics, Bearings & Seals, Troubleshooting & Problem Resolution

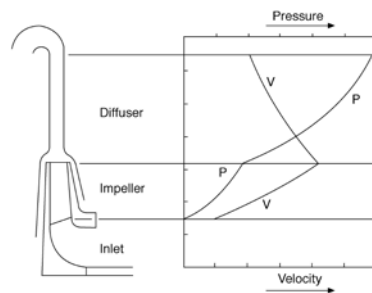
- Maximize Plant Production & Reliability
- Optimize Your Condition Based Equipment Reliability Program
- Confirm OEM Performance Guarantee
- Optimize Equipment Utilization

**TAKE ADVANTAGE OF THIS EXCELLENT OPPORTUNITY TO LEARN BASIC COMPRESSOR THEORY AND EASY, PRACTICAL METHODS TO TROUBLESHOOT COMPRESSOR PROBLEMS.**



Bangkok

June 14 17, 2010



"Notes, book & software are excellent. I still use the notes and text from your course regularly in my work." Hosam Hassan, Praxair, Toronto

### People Who Should Attend This Seminar

The people attending the course should be technical personnel interested in better understanding compressors (operators, engineers & technicians, reliability specialists, project engineers, equipment specialists and planning engineers).

### Course Objective

Basic compressor operation and maintenance and easy, practical methods to troubleshoot compressor problems. Improving plant production and reducing maintenance costs.

"I learned a lot!" Jasmin Tremblay, Ultramar (Valero), St. Romuald, Quebec

**Course Materials Includes FREE Software!** Flexware software "Flex Live XK" and "Gas Flex" will be provided along with printed material. This software is included with this training program at no additional charge. Flex Live XK software will automatically monitor the efficiency of 5 straight through compressor sections and one sidestream compressor.

### Time Schedule & Venue

Seminar duration: 4 days from 8:00 AM to 5:00 PM with lunch break from 12 to 1:00 PM and two 15 minute coffee breaks: one in the morning and one in the afternoon. The seminar location will be announced at a later date.

### Program

Following subject areas are covered over a four-day period. A tentative schedule is shown below.

"...All in all the course is excellent with a lot of valuable information being transmitted."  
Scott Schultz, Chart Energy & Chemicals, The Woodlands, Texas

#### Day One

**Introduction to Turbocompressors:** Definition of compressor. Types of compressors. Relative comparisons of various compressor types.

**Aerodynamic Components:** Axial compressors. Centrifugal compressors. Impellers, diaphragms, guide vanes. Interstage seals. Balance piston seal. Impeller thrust. Internal compressor configuration: Straight thru, double flow, back to back, multi-stage iso-cool, side-load.

**Compressor Characteristics:** Centrifugal compressors. Slope. Stonewall. Surge. Off-design operation. Influence of the different operating variables: suction pressure, suction temperature, molecular weight changes, rotational speed, etc.

**Compressor Design & Construction:** Casing, impellers, diaphragms & rotors.

**Compressor Performance:** Head & efficiency evaluation using Gas Flex software.

**Equipment Selection:** Considerations for selecting new equipment and rerating existing.

## Day Two

**Shaft Ends Seals:** Different type of seals: Labyrinth, restrictive (carbon), mechanical contact, sleeve (restrictive bushing) and dry gas seals and buffer systems.

**Journal and Thrust Bearings:** Different type of journal bearings: plain, pressure dam and tilting pad. Tilting pad thrust bearings. Bearing installation. Bearing instrumentation. Bearing damage.

**Vibration:** Vibration limits for turbomachinery & case studies.

**Rotordynamics & Rotor Stability:** Terms definitions, Unbalance critical speed map. Unbalance response analysis. Modal analysis. Rotor Stability

**Compressor Performance – Evaluation & Troubleshooting:** Head & efficiency evaluation, performance problems, solutions, troubleshooting techniques and online monitoring using Flexware Live software..

*"..overall good job." Damien Parson, Occidental Chemical, Geismar, Louisiana*

## Day Three

**Balance:** Low speed balance, High speed balance.

**Compressor and Steam Turbine Operation:** Commissioning. Start-up procedure of compressors for different type of drivers: steam turbines, gas turbines and electric motors. Operational cares. Avoiding liquid ingestion. Possible problems when operating outside the OEM performance curve.

**Turbomachinery Maintenance:** Compressor Reliability Strategies, Assembly & Disassembly procedures, Modernization Strategies.

**Troubleshooting & Case Studies:** Mechanical failures, vibration, stability & seal problems

## Day Four

**Q & A Day:** Review in detail questions about mechanical and aerodynamic issues, review use of Flexware Live software and go over specific questions and problems brought to the training seminar.

*"Nice lecture & content. Helpful to my future work." Frank Yuan, Chart Energy & Chemicals, The Woodlands, Texas*

## Instructor:

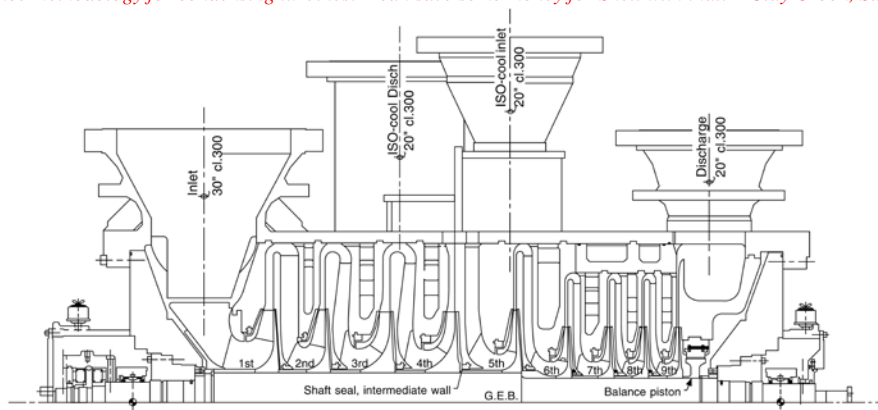


**Anibal R. Arias** is President and Technical Director of **SEMTEC**, a company specialized in Turbomachinery and its Associated Systems. Mr. Arias has worked 19 years for Petroquímica Bahía Blanca, an ethylene producer located in Argentina. During this time he was responsible for Preventive and Predictive Maintenance of Rotating Machinery; Maintenance Engineering and before resigning from the petrochemical company he was Mechanical Maintenance Manager.

In his past professional experience from 1975 to 2001, Mr. Arias taught engineering courses in Universidad Nacional del Sur. Before resigning from this position, he was Adjunct Professor of Machine Elements course. In 1990 he founded **SEMTEC**. Since then he has conducted numerous seminars and workshops on technical and maintenance organization matters in Argentina and around the world including "Compressor Performance Seminar".

Mr. Arias has a Mechanical Engineering Degree from Universidad Nacional del Sur and has extensive hands-on technical training in the USA with Davy-Mc Kee Corporation and Elliott Company. He is a member of ASME, The Vibration Institute and the Society of Tribologist and Lubrication Engineers. You can contact Mr. Arias at: [semtec@speedy.com.ar](mailto:semtec@speedy.com.ar)

*"Thank you for the heat balance methodology for condensing turbines. I can save some money for Shell with that." Clay Crook, Sarawak Shell Berhad*



For further information contact:



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*"This seminar enabled us to get more insightful on compressors." V. Govindarajan, John Crane Malaysia*

**Client Listing:** Aramco, British Petroleum, Chart Energy & Chemicals, ConocoPhillips, Consumer Coop Refineries, Dakota Gasification, ExxonMobil, Foster Wheeler, Full System Engineering, GE Oil & Gas, John Crane, Kop-Flex, Motiva, Occidental Chemical, Orinoco Iron, Petro-Canada, PDVSA, Praxair, RasGas, Shell Chemical, Sherritt Metals, Sincor, Sunoco, Syncrude Canada, Tata Chemicals, Valero

## Registration Form #905

**Flexware, Inc.,** P.O. Box 110, Grapeville, PA 15634-0110, U. S. A.

Ph (1) 724-527-3911, Fax (1) 724-527-5701 [sales@flexwareinc.com](mailto:sales@flexwareinc.com), [www.flexwareinc.com](http://www.flexwareinc.com)

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	<u>Bangkok</u> June 14 - 17, 2010	\$2,450 USD		
	Credit card payment is preferred.			
	<b>subtotal</b>			
	<b>6% Sales Tax (Pennsylvania Locations only)</b>			
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