COMPRESSED AIR SYSTEM ANALYSIS

DEVELOPED BY WILLIAM SCALES AND DAVID M. MCCULLOCH FOR THE COMPRESSED AIR CHALLENGE®

As participants of the Compressed Air Challenge® **Fundamentals of Compressed Air Seminar** learn, a compressed air system analysis can highlight the true costs of compressed air and identify opportunities to improve efficiency and productivity.

Compressed air system users should consider using an auditor to analyze their compressed air system. A number of firms specialize in compressed air system analysis, and electric utilities, equipment distributors and manufacturers, energy service companies and engineering firms, also perform it. "When selecting a service provider, it is important that factors, in addition to price, be considered," says Niff Ambrosino, chief operating officer of Scales Industrial Technologies and a CAC® Fundamentals and Advanced Instructor. "The qualifications and capabilities of the audit technicians, and reputation in the local industrial community are key and should also be considered."

Fundamentals of Compressed Air Systems WE

The Compressed Air Challenge® (CAC®) is pleased to announce the third session of **Fundamentals of Compressed Air Systems WE** (web-edition) on September 13, 2010. Led by Frank Moskowitz and Tom Taranto, this web-based version of the popular Fundamentals of Compressed Air Systems training uses an interactive format that enables the instructor to diagram examples, give pop quizzes and answer students' questions in real time. Participation is limited to 25 students. Please visit **www.compressedairchallenge.org** to access online registration and for more information about the training.

If you have additional questions about the new web-based training or other CAC® training opportunities, please contact the CAC® at **info@compressedairchallenge.org** or call 301-751-0115.

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— Niff Ambrosino, Chief Operating Officer of Scales Industrial Technologies and a CAC® Fundamentals and Advanced Instructor

An informed consumer should be aware that the quality and comprehensiveness of system analysis can vary. Independent auditors should provide recommendations that are systems-neutral and commercially impartial. Independent auditors should neither specify nor recommend any particular manufacturer's products.

A comprehensive compressed air system analysis should include an examination of both air supply and usage, and the interaction between the supply and demand. Auditors typically measure the output cfm of a compressed air system and the input kW, calculate energy consumption in kilowatt-hours and determine the annual cost of operating the system. The auditor may also measure total air losses caused by leaks and locate those that are significant.

All components of the compressed air system are inspected individually and problem areas are identified. Losses and poor performance caused by system leaks, inappropriate uses, demand events, poor system design, system misuse and total system dynamics are calculated, and a written report with a recommended course of action is provided.

"It is critical for compressed air system assessments to investigate the individual system components, the component interactions and the entire compressed air system as a whole," says Greg Harrell, Ph.D., P.E. of Energy Management Services and a Certified CAC® Fundamentals instructor. "Focusing on compressor controls, air dryers, end-use equipment, leaks and the interactions of all the components are all essential parts of an effective compressed air system management strategy. As an example of the necessity of the system focus consider a leak abatement program," he continues. "Significant attention could be given to eliminating leaks. However, if the compressor control strategy does not allow the compressors to efficiently reduce energy consumption in response, then this reduction may yield minimal benefit."

The Compressed Air Challenge® (CAC®) has developed guidelines to define two levels of system analysis services, independent of the type of firm offering these services. More information on these services can be found in the CAC® **Guidelines for Selecting a Compressed Air Service Provider**. An excerpt of these guidelines appears below. For a full copy of these guidelines, visit **www.compressedairchallenge.org** or purchase CAC® **Best Practices for Compressed Air Systems** (This 325-page manual is available at our **bookstore**):

COMPRESSED AIR SYSTEM ANALYSIS

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Overview of Levels of Analysis of Compressed Air Systems

The following levels of analysis of compressed air systems have been developed in an effort to provide commonality of terminology, methods and procedures to be used by service providers, as well as the results to be expected by end users. Energy utilities are actively involved in these efforts, and some provide incentives to use these analyses to improve the energy efficiency of compressed air systems.

There are two levels of analysis: a basic assessment and a comprehensive audit. Conducting a basic assessment is the first step in analyzing a compressed air system. Depending on individual needs, this can be conducted either by trained plant personnel or by an experienced compressed air system services provider. A basic assessment is not intended to provide the level of detail found in a comprehensive audit, but significant reductions in energy (25% or more) and lower maintenance costs often result from a basic assessment alone. Once initial opportunities have been identified, you can decide whether additional analysis services are required to further define system dynamics and corresponding system improvement opportunities. This decision will depend, in part, on the size and complexity of the system being examined (both supply and demand) and whether critical issues requiring further investigation to identify their causes and potential remedies surfaced during the evaluation.

Basic Compressed Air System Assessment

A basic system assessment of a compressed air system is the first level of analysis. Depending on the complexity of the system, a basic system assessment can be conducted by either trained plant personnel or by an experienced compressed air system efficiency expert. Using readily available data combined with limited measurements, an expert can identify system inefficiencies and make recommendations that will result in energy cost reductions.

CAC Qualified Instructor Profile

Niff Ambrosino
Scales Air Compressor Corp.
185 Lackawanna Avenue
W. Paterson, NJ 07424
Ph: (973) 890-1010
Fax: (973) 890-7343
Email: niff@scalesair.com

Niff Ambrosino is chief operating officer for Scales Industrial Technologies, one of the nation's leading compressed air systems distributor and service companies. With over 38 years in the compressed air industry, Niff has in-depth experience working as a shop rebuild mechanic, field service technician, sales engineer, energy auditor/surveyor and manager. Niff is a certified Level I and Level II Compressed Air Challenge® instructor, has trained sales/service personnel and conducts compressed air system seminars for end users.

Production downtime and maintenance costs also may be reduced. Basic system assessment of the facility could reveal:

- Potentially inappropriate uses of compressed air
- Significant leaks
- Processes or individual end-uses most sensitive to low pressure
- System instability
- High-volume and intermittent uses
- Capacity control problems
- Maintenance and reliability issues

There are two levels of analysis: a basic assessment and a comprehensive audit.

Comprehensive Compressed Air System Audit

A comprehensive system audit is the top level of system analysis, conducted by an experienced compressed air system auditor. It is a detailed analysis of the entire compressed air system, and may have been preceded by a basic system assessment. Measurements and data logging are generally part of comprehensive compressed air system audit procedures.

The customer's objectives and system problems will be discussed prior to the start of the audit, and the proposed procedures also will be explained. The objective is proper management of the complete compressed air system for optimum efficiency and reliability. This includes alignment of the supply side (compressors, their controls, aftercoolers, dryers, filters and primary air receivers) with the demand side (distribution piping system, secondary air receivers and all of the end-uses of compressed air, including leaks), in conjunction with the needs and financial objectives of the business unit.

CAC Qualified Instructor Profile

Greg Harrell, Ph.D., P.E.
Energy Management Services
341 Willocks Drive
Jefferson City, Tennessee 37760
Ph: (865) 719-0173
Email: gregharrell@emscas.com

Greg Harrell is a certified Level I Compressed Air Challenge® instructor. Dr. Harrell has conducted many energy surveys for industrial clients throughout the world and is also a primary instructor in the North Carolina State University Energy Management Diploma Program.

The instructors featured here are available to lead a Compressed Air Challenge® seminar at your facility. Visit www.compressedairchallenge.org for more information.

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COMPRESSED AIR SYSTEM ANALYSIS

A comprehensive system audit is the top level of system analysis, conducted by an experienced compressed air system auditor.

The auditor should accomplish the following during a comprehensive audit:

1. Establish a baseline, against which the results of any proposed changes are measured.
2. Draw a block diagram and a review of the compressor room to determine present compressor operations, control strategy and the storage capacity.
3. Record compressor and dryer pressures and temperatures.
4. Validate end-use pressure and quality requirements.
5. Conduct data logging of readings of power and pressure (and flow, if applicable) throughout the system for a more in-depth analysis of the dynamics of the system and resulting problems. Provide graphs showing data collected over time.
6. Construct a demand profile to identify significant end-uses and their impact.
7. Construct a pressure profile to identify what determines the system operating pressure and to identify possible changes.
8. Review primary and secondary air receiver capacities.
9. Establish a controls strategy through real-time analysis.
10. Identify customer approach to air leak detection and repair and make recommendations for improvement.
11. Review differences in shift operations and impact on air use.
12. Identify compressed air end-uses which may be better served by other means and recommend suitable alternatives.
13. Compare air quality provided for each end-use with what is really needed and make appropriate recommendation(s).
14. Review maintenance procedures and training.
15. Review initial verbal proposals with all who attended a pre-audit meeting to obtain buy-in from all departments involved.
16. Provide a comprehensive written report of all findings, recommendations, and results. BP

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BEST PRACTICES

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Working Together for Compressed Air Best Practices

Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** and **Productivity Improvement Opportunities** in Compressed Air Systems for specific **Focus Industries**. Each edition outlines "Best Practices" for compressed air users — particularly those involved in **managing energy costs in multi-factory organizations**.

Utility and Energy Engineers, Utility Providers and Compressed Air Auditors share techniques on how to audit the "demand-side" of a system — including the **Pneumatic Circuits** on machines. This application knowledge allows the Magazine to recommend "**Best Practices**" for the "supply-side" of the system. For this reason we feature **air compressor, air treatment, measurement and management, pneumatics, blower and vacuum** technologies as they relate to the requirements of the monthly **Focus Industry**.

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