

GLOBAL Gas Turbine News

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2002

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in AMSTERDAM
3-6 June**



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A Few of the Highlights of TE'02 Not to be Missed!

- Pre-conference workshop on Basic Gas Turbine Metallurgy and Repair Technology
 - Hosted "Welcome Reception" at the Rijksmuseum, sponsored by Shell Global Solutions Int'l. B.V.
 - World-renowned Technical Congress presenting leading-edge technology and key industry issues relevant to your company's success and your professional advancement:
 - 143 technical sessions over 4 days
 - More than 600 refereed technical papers and 14 panels
 - More than half the papers presented by industry including a Distributed Generation track
 - Complete Users Symposium with 30 panels, tutorials and discussion sessions in three tracks:
 - Engineering and Business
 - Operations and Maintenance
 - Repair Technology
 - CD-ROM with all 600+ published papers included in registration fee
 - Exceptional Keynote Speakers:
 - Peter Hartman, Man. Dir. & COO of KLM
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 - Alexis Fries, President of ALSTOM Power
 - International 3-Day Exposition: June 3-5
 - Hospitality Suite each morning at the Okura Hotel
 - Special Guest Tours for family and friends, including tours of Amsterdam and the "Floriade"
 - Highly informative Facility Tours:
 - E.ON Beelux
 - National Aerospace Laboratory NLR
 - Essent Energy B.V.
 - Opportunity to network with the best researchers and problem-solvers in the worldwide gas turbine industry
- More than you can possibly absorb yourself ... so bring a colleague! ***





The Missing Link



Dave Wisler

Chair

IGTI Board of Directors

No, I have not found the so-called missing link in the theory of evolution. But as I reported in the last issue of Global Gas Turbine News, the link between the Committees and the Board of Directors was not well served by the Leadership Workshop. This Workshop, held the Sunday afternoon before the start of TURBO EXPO, was seen by the Committee leaders as the place where the “tablets” were brought down from the mountain (where the Board resided). Committee leaders suggested that this format did not provide an effective avenue for member concerns to be explored.

So we changed! The Leadership Workshop will be replaced by a newly created “Council of Chairs” to better complete the link between the Committees and the Board of Directors. Previously, the Leadership Workshop was “owned” and run by the Board, with the Incoming Board Member setting the agenda. We have now turned things upside down, or in this case, correct side up. The Council of Chairs will be “owned” and run by the Technical Committees and the leadership of the Gas Turbine Users Symposium. Make no mistake about it, this is not another layer of bureaucracy. It is a mechanism for the IGTI membership to express their views and concerns to their Committee leaders, and through the Council of Chairs to the Board of Directors.

At our last Board meeting in Miami, Incoming Board Member Harold Simmons and Incoming Member-elect Tony Strazisar were given the responsibility to make the Council of Chairs initiative happen. Rakesh Bhargava, Chair of the Industrial and Cogeneration Committee, was approached and enthusiastically accepted the responsibility to take ownership and lead the effort at this year’s TURBO EXPO in Amsterdam. Here is Rakesh’s letter to me expressing his initial thoughts about the Council of Chairs. These thoughts will, of course, be brought up to the full Council for confirmation and/or amendment.

March 13, 2002

Dear Dave,

Pursuant to our conversation regarding the Council of Chairs, please find here my thoughts:

What is a Council of Chairs?

The Council of Chairs, operating independently of the IGTI Board of Directors, is comprised of IGTI’s Technical Committees’ Chairs, Vice-chairs and Gas Turbine Users Symposium leadership. This Council will be a link for communication to and from the IGTI Board of Directors for the ultimate success of the IGTI.

Mission Statement of the Council of Chairs:

The main objective of this Council is to provide a forum to discuss matters important to the IGTI and its members and make recommendations to the IGTI Board of Directors.

Some of the immediate objectives are:

- Establish a strong link between the volunteer members and the IGTI Board of Directors
- Identify issues which are important to enhance and promote the IGTI missions
- Market the IGTI in a changing world and economy
- Identify methods for effective utilization of limited resources in the Internet age
- Explore means to increase IGTI’s financial resources
- Retain and increase IGTI membership
- Promote the IGTI among young engineers and female professionals

How the stated objectives and mission of the Council of Chairs will be achieved?

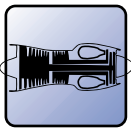
Each year, on the Sunday before the start of the Turbo Expo Congress, a meeting of 2-3 hours will be organized based on the pre-defined agenda. This meeting will be organized by volunteer leaders, identified one year in advance, who are available to lead the meeting. The agenda will be developed based on the feedback from the volunteer members. The incoming Board member will be present in the meeting to represent the IGTI Board of Directors and provide logistic support for functioning of the Council of Chairs. The outcome of the discussion will be summarized and provided to the Board of Directors in a timely manner. The Board will then act on the issues presented and respond to the Council of Chairs in a timely manner.

I hope this is helpful to you. Should you have any questions, please let me know.

Regards,
Rakesh

As Board Chair, I ask that the IGTI membership give Rakesh your full support.

One more thing – A “Rap Session” will be held in Amsterdam, probably on Thursday, June 6, for anyone from IGTI to visit with Board members to discuss suggestions, ideas and issues of concern. Check your final program for the exact date and time. And yes, the Board members, in good “Star Wars” fashion, will have their shields down.*



A **Pratt & Whitney**-led team has won the Collier Trophy for 2002 for its development of the Integrated Lift Fan Propulsion System (ILFPS) for the F-35B Joint Strike Fighter. The Collier award also honors **Rolls-Royce** for its work on the short take-off/vertical landing ILFPS, as well as F-35 prime contractor **Lockheed Martin, Northrop Grumman** and **BAE SYSTEMS**. On July 20, 2001, the X-35B prototype became the first and only aircraft in history to perform a short take-off, followed by a supersonic dash in level flight, and a vertical landing, all in one flight.

The gas turbine maintenance group **Rolls Wood Group** (Repair & Overhauls) USA Inc. (RWG) has acquired from California-based Rolls-Royce Engine Services Oakland (RRESO) its industrial engine program consisting of the Rolls-Royce (formerly Allison) 501K and 570/571K product lines. RWG now has a major share of the world-wide market in providing aftermarket services for the 501K and 570/571K engines.

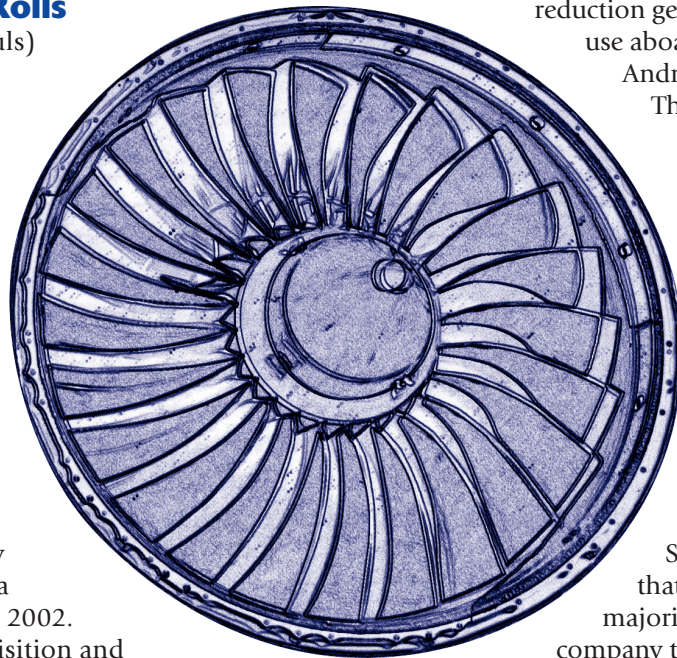
The second build of the advanced six-stage high pressure compressor (HPC) being developed as part of CFM Project TECH56 has successfully completed full-scale rig testing, with a third build scheduled to go on test in 2002. Project TECH56 is a technology acquisition and maturation program of **CFM International** (CFM). The HPC achieves much higher stage loading with fewer airfoils and rotors, thus providing operators with high efficiency and lower maintenance costs.

Capstone Turbine Corporation has announced that several of its early microturbines have passed crucial endurance milestones. Four 30 kW microturbine systems, operating in widely different conditions, have exceeded 18,000, 19,000 and 25,000 hours of near-continuous operation.

Pratt & Whitney Power Systems has introduced the SWIFTPAC mobile power series mobile and transportable power units of 4, 25 and 50 MW. The SWIFTPAC series are configured as either single trailer (4 MW) or multi-trailer systems (25 and 50 MW). These utilize the ST40 (SWIFTPAC 4 unit) or the FT8(R) (SWIFTPAC 25 & 50 units) industrial gas turbines.

Lockheed Martin has been awarded a \$1,115,000,000 contract to re-engine the U.S. Air Force's Lockheed C-5 Galaxy transport aircraft. This contract will cover the removal of the four General Electric TF39(CF6-6) engines on each C-5 and replace them with four of GE's F103(CF6-80C) turbofans.

GE Marine Engines' LM2500 aeroderivative marine gas turbines and main reduction gears have been selected for use aboard the Italian Navy's new Andrea Doria aircraft carrier. The ship is being built at Fincantieri's Riva Trigoso, Italy, shipyard. GE will manufacture the LM2500 gas turbines at its Evendale, Ohio, facility, and the gears at the Lynn plant. Fincantieri will deliver the aircraft carrier to the Italian Navy in June 2007.



Turbomeca and South Africa have agreed that Turbomeca will acquire a majority equity holding in a company to be formed from Denel Airmotive. This new company will be named "Turbomeca Africa". The new company will become the African continent's service center for Turbomeca engines.

Turbomeca Africa will also manufacture engine parts for Turbomeca, General Electric, Rolls-Royce and Volvo, and will also repair and overhaul some Turbomeca and Snecma Moteurs engines.

ALSTOM Power has been awarded a contract, valued at approximately 375 million euros (\$323 million), to supply the National Iranian Gas Company (NIGC) with 50 ALSTOM GT 10 industrial gas turbine compressor sets to be installed in 18 compressor stations on the IGAT pipeline system within Iran. *

Gas Turbine News in Brief ... is compiled for Global Gas Turbine News by Carl E. Opdyke, Power Systems Aerospace Analyst, FORECAST INTERNATIONAL, 22 Commerce Road, Newtown, Connecticut 06470.



Future Aircraft Jet Engines Will Think for Themselves

Researchers are laying the groundwork for engine technologies leading to affordable, high-performance and intelligent gas turbine engines.

by Timothy J. Lewis, Propulsion Directorate, Air Force Research Laboratory, Wright-Patterson AFB

The Propulsion Directorate has initiated conceptual studies to help define the successor to the highly successful Integrated High Performance Turbine Engine Technology (IHPTET) program. This follow-on effort, called the Versatile Advanced Affordable Turbine Engines (VAATE) program, will extend IHPTET's predominant focus on improving engine performance to encompass total propulsion system affordability. Affordability can mean many things, but in this case it is defined by the amount of capability that can be acquired for a given cost. Engine capability is typically measured in terms of thrust-to-weight ratio and specific fuel consumption. Life cycle cost, the sum of the funding required to develop, produce, and support a fleet of engines over the life of the weapon system, is the usual metric for describing the cost to deploy a given capability. A mathematical expression has been created to enable quantification of affordability improvement at the engine level:

Capability / Cost Index (CCI) =

$$\frac{\text{Capability}}{\text{Cost}} =$$

$$\frac{\Delta T / W_{\text{max power}} / \Delta \text{TSFC}_{\text{SLS}}}{[\Delta \text{Cost}_{\text{development}} + \Delta \text{Cost}_{\text{production}} + \Delta \text{Cost}_{\text{maintenance}}]}$$

Where:

- $\Delta T / W_{\text{max power}}$ - Relative Engine Thrust/Weight at Maximum Power, Sea Level Static
- $\Delta \text{TSFC}_{\text{SLS}}$ - Relative Thrust Specific Fuel Consumption, Sea Level Static
- $\Delta \text{Cost}_{\text{development}}$ - Relative Engine Development Cost
- $\Delta \text{Cost}_{\text{production}}$ - Relative Engine Production Cost
- $\Delta \text{Cost}_{\text{maintenance}}$ - Relative Engine Maintenance Cost.

The goal of VAATE is to increase turbine engine affordability, i.e. capability-to-cost index, by 10X. Achievement of this aggressive goal will require continued development of capability-enhancing technologies, a la IHPTET, along with an increased emphasis on technologies to reduce engine development, production, and maintenance costs.

THE VAATE PROGRAM

The VAATE program has been structured around three focus areas (Figure 1) to emphasize specific themes important to achieving the 10X goal. The *Durability Focus Area* will proactively develop design and test protocols to prevent component failure, increase life, enhance repairability, and ultimately improve warfighter readiness. The *Versatile Core Focus Area* will develop technologies for a multi-use, 4000-hour maintenance-free core. The *Intelligent Engine Focus Area* will build on the efforts of the other two focus areas by developing and integrating technologies that provide for durable, adaptive, damage-tolerant engine health and life management features. In order to attain the significant cost and weight reductions required to achieve the VAATE 10X goal, engine/airframe integration technologies will be critical. Aircraft thermal management, power generation, and flight control functions (via thrust vectoring nozzles) will be integrated into the engine. The VAATE program, specifically the Intelligent Engine Focus Area, will evolve engines from simple thrust producers into integrated propulsion and power systems.

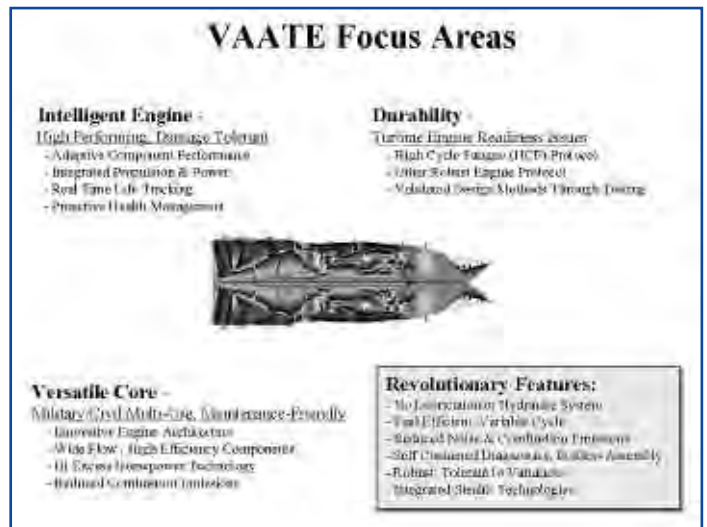


Figure 1. VAATE Focus Areas





Intelligent Engines

Researchers in the exploding field of machine intelligence have identified a variety of technologies that will enable turbine engines to adapt and learn. These abilities will be the key discriminators between intelligent and conventional engines. Current engines respond in a somewhat fixed and inflexible manner to changing environmental conditions. Because of this inflexibility, their design is governed by the worst case deterioration and operating conditions. This leads to large safety margins in design, operation, and maintenance concept that ultimately compromise performance and increase sustainment costs. An intelligent engine will be flexible and able to adapt, either actively or passively, to changing environments, either internal (engine health) or external (new/changed missions), and still deliver exceptional performance with minimum maintenance throughout its life.

Acquiring these capabilities will require the combination of advanced aerodynamics, high performance materials, and innovative structural concepts with emerging active control, prognostic health management, and information technologies. The Intelligent Engine Focus Area will develop these technologies, thus enabling a new generation of turbine engines with revolutionary features (Figure 2).

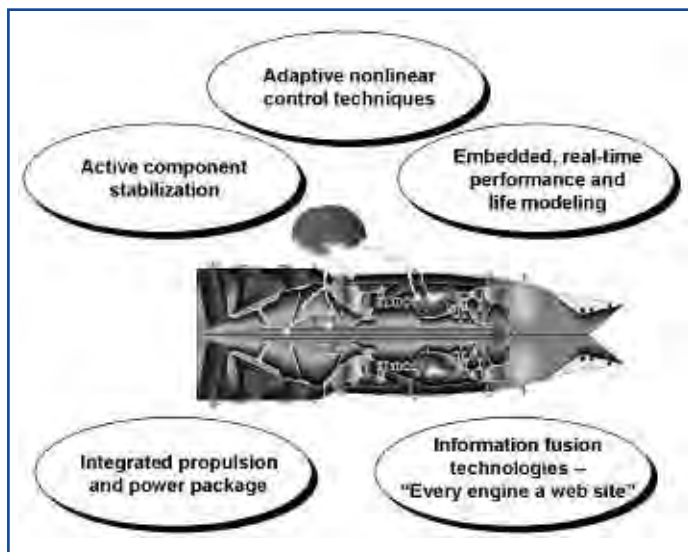


Figure 2. Intelligent Engine Technologies

Engines with active compressor and combustor controls can provide efficient, wide operating ranges and avoid unstable, damaging operating modes. Engines that use nonlinear, auto-adaptive control techniques for continuous performance optimization and automatic reconfiguration will pro-

vide condition-based performance, i.e., automatically accommodate deterioration and battle damage to deliver the best possible performance from a degraded engine. Engines with embedded, highly accurate, real-time performance and life models and specialized diagnostic sensors will enable automated troubleshooting and maintenance forecasting. Intelligent engines can be linked together in an "engine area network" (every engine a web site), thus providing instant, fleet-wide awareness when problems arise and allowing prognostic and diagnostic decisions based on redundant information to be made rapidly and accurately (Figure 3).

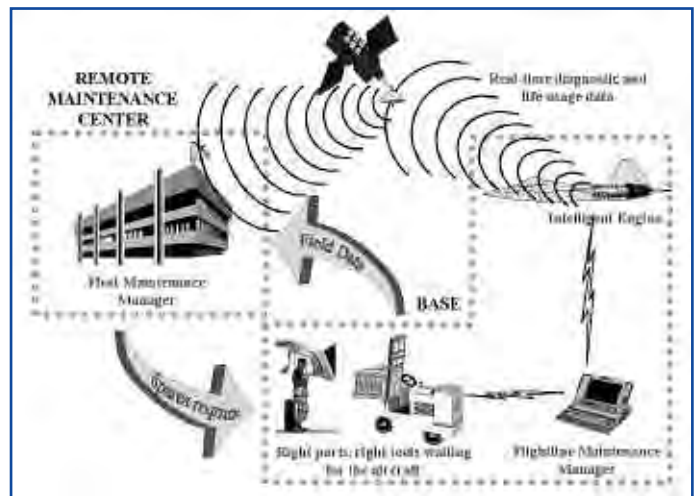
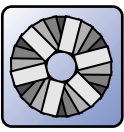


Figure 3. Engine Area Network

SUMMARY

The intelligent engine represents a true leap in capability beyond current engines. Advances in engine health management and active control of individual engine components will lead to future aircraft engines with maintenance characteristics superior to even automobile engines. These technologies will prevent the engine from damaging itself by controlling component stability, running clearances, and combustor temperature profile; continuously track life and performance to provide warnings of incipient failures; and detect, accommodate, and precisely diagnose actual failures. An intelligent engine will be essentially maintenance-free (no inspections, fluid sampling, etc.) until it flags the need for some repair action, and that repair action will be precisely described. The VAATE program will combine these technologies with those developed in the Versatile Core and Durability Focus Areas to set the stage for a new generation of capable, affordable, survivable propulsion systems for expendable, unmanned, and manned weapons systems. *



Reliability Centered Maintenance (RCM) Techniques for Heavy Duty Gas Turbines in Oil & Gas Applications

by Erio Benvenuti and Giuseppe Fabio Ceschini, GE Oil & Gas - Nuovo Pignone

INTRODUCTION

Reliability Centered Maintenance (RCM) techniques have been widely used for almost 30 years, especially in the airline maintenance area for which they were initially developed.

The traditional focus of RCM techniques has been on the development of a "tailor made" preventive maintenance policy, driven by Reliability. This was justified by both safety and cost considerations. However, while improved operational safety can be demonstrated, cost reductions attributable directly to RCM techniques are more difficult to measure. In other words, it is difficult to prove that any achieved cost reduction resulted from inherent RCM methodology rather than from management policies like detailed planning, manpower monitoring, or improved training. For this reason, several changes have been made to improve the effectiveness of this methodology from both a theoretical and a management perspective.

Oil & gas plants, especially those operating on heavy duty gas turbines, generally need to focus more on Availability than Reliability. The primary reason for this is that oil and gas operations tend to be 24/7 processes and any power generation outage (be it planned or unplanned) results in an interruption in the flow of revenues.

Because of this emphasis on Availability, large companies that have outsourced maintenance and related engineering activities by establishing Long Term Service Agreements (LTSAs) with engine manufacturers, have included new clauses in their service contracts linked to Availability; and risk assessment is not based on Reliability alone anymore.

Moreover, industrial plant managers and operating crews need simple and optimal maintenance tasks to perform so that field measures will exhibit the "minimum distance to reality." Once all measurable parameters are accounted for, correctly weighted and correlated, the resulting analysis can lead to real Availability optimization. Finally, from the global service supplier perspective, it has become mandatory to minimize maintenance costs without negatively impacting effectiveness.

OIL & GAS SERVICE BUSINESS TRENDS AND DEVELOPMENTS

Current market developments are leading to closer relationships between customers and engine manufacturers. Reliability is no longer the single most important parameter determining a supplier's ability to satisfy critical client requirements for two main reasons.

First, any Reliability Assessment, even when validated by the development of extensive supplier generated field databases and experience, can yield totally invalid results if customer responsible preventive maintenance is not properly carried out. This can become critical and more difficult to manage when clients outsource maintenance, since it now involves three parties, i. e. customer, equipment supplier and maintenance vendor.

Second, the increasing number of opportunities offered by the global marketplace need to be considered. For any manufacturer it is preferable to supply comprehensive service packages in association with specific equipment, allowing them to more easily take full responsibility for maintenance procedures and offer guarantees on production continuity (Regularity) to customers.

Most contracts are currently based on minimum Availability requirements, rather than Reliability. Furthermore, OEM's providing services are often encouraged to increase the performance of their equipment to comply with Bonus/Malus clauses based on predefined Availability thresholds. As a consequence, OEM's are strongly motivated to control maintenance costs without decreasing effectiveness levels in order to gain associated bonuses in a win-win partnership with customers that are seeking to achieve production premiums.

In case high Availability targets (>90%) are specified in service contracts, they can be reached and surpassed only by concurrently focusing on Reliability, Maintainability and Logistics. As a result, Availability should not be considered as a simple linear consequence of three different independent parameters, but as the main criterion to establish the best "mixture" of all the three factors together.

WHY A NEW APPROACH IS NEEDED?

When traditional RCM methodologies are used, there are some important factors to consider:

1. Typical classifications of Criticality often lead to qualitative analyses (traditional FMECA* and RCM methodologies), with results that are incompatible with the need for practical and effective decision processes supporting maintenance plans.
2. In most cases, analyses result in simple snapshots of conditions at one point in time so that often, after a few months, maintenance organizations revert to using rule-of-thumb decisions that are seldom optimal, and show the ineffectiveness of this "traditional" method.

* Failure Mode Effect & Criticality Analysis



3. Use of traditional RCM decision processes makes it very difficult to assess how many of selected tasks are feasible and worthwhile. Moreover, simple YES/NO answers are somewhat misleading, because often in-between situations appear to be more realistic.
4. Some RCM methodologies optimize Preventive Maintenance and related tasks, without taking a minimum amount of Corrective Maintenance into account. Traditional methodologies usually forget spare parts stocking optimization based on part criticality. A just-in-time policy should instead be established for maintenance spare parts management.

A valid maintenance task decision tree must evaluate the impact of all major Availability "bricks": Reliability, Maintainability and Logistics. Although there are second-order factors related to interactions among these "bricks", it is a valuable approach to establish a method capable of including at least these basic considerations.

FEATURES OF THE NEW APPROACH

Three main objectives can be achieved by using the new approach:

1. Quantify and measure Criticality levels of complex systems, both from the technical and economic standpoints. With regard to the technical aspects, it is no longer possible to deal with Reliability simply by means of constant failure rates. In oil & gas applications it is in fact mandatory to consider progressive aging and damaging rather than random failures, by using the Weibull parameters. Attempting to optimize preventive maintenance frequency would not make sense if aged and new component failure probabilities are equally rated. From an economic standpoint, a "severity" factor needs to be established to include simple but actual and measurable parameters like component costs, Mean Time To Repair, accessibility, re-supply delivery time, etc.
2. Take account of Reliability, Maintainability and Logistics simultaneously. Taking care of Logistic time (and consequently cost) is often an option, and the same is true for Maintainability, thus neglecting their first-order effects on Availability. This makes it possible to overcome a typical limitation of the traditional method.
3. Associate maintenance with other company structures, thus making it possible to build a common language that can be equally understood by production, maintenance and operations teams.

Secondary and consequent targets deriving from the above three are:

- Provide robust analyses;
- Select optimal and shared sets of tasks;
- Achieve better control on maintenance plan effectiveness (i. e. capability of reaching the maintenance plan target) and efficiency (i. e. minimizing allocation of resources) by appropriately integrating technical and economic data.

ANALYSIS PHASE

Robustness of analysis is assured by using Reliability Block Diagrams (RBDs). RBDs are developed from plant process and instrumentation (P&I) diagrams showing the relationships among plant components. Each component is represented as a block. To these blocks are added cost, Reliability and other data, leading to the development of RBDs. This tool helps to better investigate functional links among the gas turbine system components by highlighting redundancies and critical nodes, taking into account correct failure distributions (not just exponential) and repair distributions (not just uniform), and avoiding excessive simplifications. The application of Monte Carlo statistical simulations to this data can thus provide quantitative assessment of the steady-state availability of complex systems.

One of the most evident deliverables of this method is its capacity to rank the Reliability Importance (R.I.) over time (t) of any component (i) vs. the system (s) it belongs to. The following formula is used for this purpose:

$$R.I._i(t) = \frac{R_s(t)}{R_i(t)}$$

where $R_i(t)$ is the reliability function of component (i) over time, and $R_s(t)$ is a mathematical expression of system reliability as a whole over time. In Fig. 1 a typical maintenance plan optimization process is shown, highlighting the use of Leverage Factors and the related quantitative assessment of the Availability improvement ("What -If" Analysis).

From an operations standpoint, the objective is to develop a non-dimensional index ranging between 0 and 1 to rate the importance of any component in relation to plant availability. It can be used to map and continuously monitor areas containing measured and assessed criticality. Major index properties are: dynamic, time dependent and monitorable, both from the technical and economic perspectives.

Use of this index makes it possible to simultaneously consider all factors deeply influencing the Availability of complex systems.

With regard to Severity Assessment, the following costs are considered in the new approach:

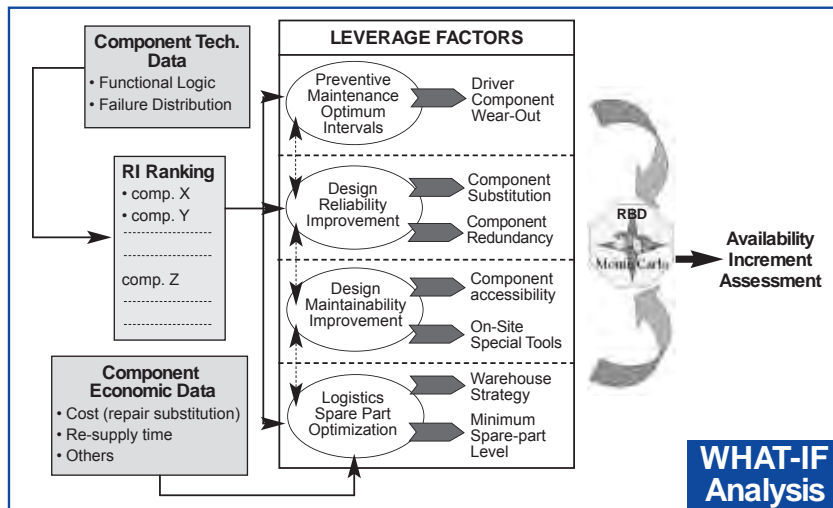
- Supply and delivery costs (planned or emergency);
- Labor costs (corrective or preventive);
- Warehousing costs (capital tied up as well as stock);
- Loss of production costs;
- Domino effect costs;
- Spare parts costs (new or repaired);
- Contractual penalty costs.

Integration of the above costs into the Severity Assessment yields a percentage number which varies directly with the severity of the impact on the plant (e.g.: the higher the severity percentage, the greater the impact from failure). Use of a normalized parameter to economically synthesize Severity allows for closer evaluation of each individual application; consequently more accurate decisions are possible.



TECHNOLOGY

RCM ... continued



CONCLUSIONS

Maintenance engineering is a very complex subject that needs the right combination of deterministic and statistical tools, besides the basic knowledge of plant and machine characteristics. The "more than linear" dimension of the problem can now be captured without using too drastic simplifying hypotheses that can easily lead to incorrect maintenance priorities. The Reliability Block Diagram technique and the related capability of Monte Carlo simulations, concurrently with the use of priority index accounting for the economic impact of failure, seem to provide better answers than those supplied by traditional RCM methods. *

* Risk Priority Number (RPN) is found by multiplying a Severity Rating (1-10) by an Occurrence of Failure Rating (1-10) by a Detectability Rating (1-10) with the resulting number indicating the amount of risk involved with a particular component. A high number indicates a need for focus on that component because of the high risk of significant damage if failure should occur. This system is more qualitative than quantitative and the "new approach" offers an improvement.

ASSESSED BENEFITS OF THE NEW APPROACH

In testing the new approach, surprising differences were found between maintenance priorities suggested by the new approach and those suggested by the standard FMECA-RCM method as expressed by the Risk Priority Number* (RPN). Basically, by following wrong indications based on the traditional RPNs, unnecessary maintenance tasks would have been performed, with the consequent deferral or cancellation of others required by higher availability priority indices, with increased risk of unplanned downtime, waste of resources and loss of financial benefits.

Moreover, the ability of the new approach to accurately determine capital parts wear-out behavior, instead of subjecting oneself to simple random failures, clearly leads to correct plant warehouse sizing without worsening re-supply timeliness.



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The International Gas Turbine Institute of The American Society of Mechanical Engineers is dedicated to supporting the international exchange and development of information to improve the design, application, manufacture, operation and maintenance, and environmental impact of all types of gas turbines and related equipment.



My Memories of the International Gas Turbine Institute

by Norman Dibelius, Chairman 1983-84

Last year IGTI solicited comments from past Chairs of IGTI regarding their remembrances. We will publish selected responses from time to time to give new and prospective members of IGTI an insight into our history. Ed.



Frank Whittle developed the concept of a turbojet engine in 1930. Interest in gas turbines was fanned by the first flight powered by Whittle's turbo jet engine which took place in England in 1941 during World War II. The gas turbine, supposedly having only one moving part, was touted for its simplicity and light weight. One American engineer who became fascinated by gas turbines in the early 1940s was R. Tom Sawyer. Tom laid the groundwork for the Gas Turbine Division of ASME in the 1940s. In 1947 he became the division's first chairman. He was followed by gas turbine pioneers: J. T. Rettallians 1948, J. K. Salisbury 1949, J. I. Yellott 1950, and Mr. Gas Turbines Bruce O. Buckland 1959. Bruce was one of the very few engineers who could design every component of a gas turbine, including the controls, all by himself. He was a pioneer in many ways. As a boy Bruce traveled to Colorado by covered wagon. As an engineer he was a pioneer in the fledgling gas turbine industry. He was an unassuming and rugged individual who, after retirement, lived alone on the shore of Lake George, New York, until a few months before he died last winter at the age of 100.

With entrepreneurial spirit and great imagination and foresight, these pioneers recognized the potential of gas turbines and directed their energies toward helping to build a gas turbine industry. Part of their strategy was to start a gas turbine division within ASME for the purpose of disseminating information about design, development, manufacture, and application of gas turbines to the needs of the power and resources hungry world after World War II. They recognized that gas turbines had the advantages of light weight and did not need water for cooling. In addition to powering aircraft, gas turbines could be sited in desert regions where cooling water was scarcer and more costly than fuel. Thus, gas turbines were used in the Middle East to power pumps for oil and gas pipelines. However, gas turbine efficiency was low, and recovery and combined gas turbine/steam turbine units were developed. Gradually, cooling techniques and high temperature materials were developed which allowed operation at higher turbine inlet temperatures with resultant higher efficiency. These developments were the result of the combined efforts of industry,

academia, and government. The Gas Turbine Division of ASME played a significant role in helping to disseminate technical information and data regarding research and development. Gas turbine design conferences, which included the display of gas turbines produced by major manufacturers, were organized. Entire gas turbines were on display on the exhibition floor where prospective users could see the equipment and talk to manufacturers' representatives. Initially, conferences were held only in the United States. Subsequently, conferences were held in the largest cities in Europe every fourth year and eventually every other year. When the Japanese became involved in manufacturing and using gas turbines for electric power generation, mini conferences, sponsored by the Gas Turbine Division, were also held in Japan. During my tenure as chairman, and in response to the needs of European gas turbine engineers, the groundwork was laid for sponsoring mini conferences in Europe between the years of full conferences.

In 1980 I was invited, by the Chinese Academy of Sciences, to organize a series of lectures in The Peoples Republic of China. In 1982, eight of us went to China for what we called a Technology Exchange. Four of the lecturers were from industry and four from academia. A second Technology Exchange was held a couple years later. IGTI held a full-fledged conference in Beijing 1985 and, if my memory serves me correctly, it was attended by twenty-five thousand Chinese. Many of the attendees were students, but many were engineers, scientists, and potential users. Three of the attendees were ministers of the Chinese Government. The ministers reported directly to the Chairman of The Peoples Republic of China and their approval was needed in order for any gas turbine power plant to be sited in China.

As chairman of the Gas Turbine Division in 1983-84, I made a presentation to the ASME Board proposing that the division be changed to an international institute. Shortly thereafter, the Gas Turbine Division metamorphosized into the International Gas Turbine Institute. It has been fascinating to witness the growth of the fledgling gas turbine industry of the 1940s to the mature industry it is today. In the 1940s and 1950s, entire gas turbines were small enough to be displayed on the exhibit floor. Today, the equipment is

My Memories of the International Gas Turbine Institute ... continued

far too large to even contemplate displaying whole units at a conference. It is apparent that the nature of the conference and products now must adapt to present day needs of the industry if the organization is to remain viable.

In these days of globalization, there is great need for power of all kinds in regions other than the western world. I believe it would behoove IGTI to consider holding mini conferences in carefully selected emerging countries. Consideration must be given to the potential application for gas turbines, transportation, who would attend, monetary con-

siderations, differences in customs, and risks including health risks. The kind of conference appropriate to regions of the world where information about gas turbines is sparse, and financing and transportation difficult, is quite different from conferences in the western world where the gas turbine industry has become mature.

I will be forever grateful for my association with all the people of IGTI. I count serving on the Board from 1980 through 1984 among the most interesting and rewarding experiences of my life. *

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In cooperation with Forecast International/DMS, the IGTI Board of Directors is pleased to announce the availability of a new 10-year gas turbine industry forecast. The report will be prepared by the Forecast International Power Group for the IGTI Board of Directors for June delivery. The data used to prepare the report is effective as of May 2002, and is drawn directly from the company's *Gas Turbine Forecast* service, as well as from associated databases and other sources.

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Gas Turbines for a Better Tomorrow ... Meet the Keynote Speakers ...



Peter F. Hartman
Managing Director & Chief Operations
Officer of KLM

Born on Curacao, Peter F. Hartman studied Mechanical Engineering at Amsterdam Polytechnic and Business Economics at the Rotterdam Erasmus University where he received his master's degree. He joined KLM as a Work Analyst for the Engineering & Maintenance Controllers' department in 1973. He moved through various positions as controller in and outside The Netherlands in the following years.

In 1984, Mr. Hartman was appointed Director Technical Contract Services responsible for selling KLM technical maintenance services to other airlines. In 1989 he became Vice President KLM Ground Services Schiphol; in 1990 Senior Vice President Customer Services; and in 1994 Executive Vice President Personnel & Organization.

In 1996, Mr. Hartman took the position of Executive Vice President Engineering & Maintenance. Since August 6, 1997, Peter Hartman has been appointed to the Board of Managing Directors as KLM's Chief Operations Officer.

Founded on October 7, 1919, KLM Royal Dutch Airlines is the oldest scheduled airline in the world still operating under its original name. Among IATA carriers KLM now ranks 6th in terms of international ton-kilometers traffic.

At present the KLM route network comprises 150 cities in 67 countries on all continents. Together with its alliance partners the total number of destinations increases to more than 300. The fleet consists of 98 modern aircraft with seven next generation planes on order.

KLM's home-base is Amsterdam Airport Schiphol, numerous times elected best airport in Europe and the world. In total KLM employs more than 26,000 people, excluding its subsidiaries.



Ludo M. J. van Halderen
Chief Executive Officer of NUON

Born in Schiedam, The Netherlands in 1946, Ludo M.J. van Halderen graduated from the Technical University of Delft in 1970. Until 1986 he was involved in a wide range of activities in the energy business, especially in the generation of electricity from natural gas and coal. His involvement included the reintroduction of coal firing in the mid-seventies in the power company PGEM.

Mr. Van Halderen has been involved since the beginning in the discussions to restructure the electricity business in The Netherlands. In 1986 he was one of the cofounders and became CEO of the electricity generating company EPON, a merger of four regional companies in the North-East of The Netherlands.

Since 1993 Mr. Van Halderen has participated in the committees that advised the Minister of Economic Affairs on the evaluation and improvement of the electricity organization in The Netherlands, resulting in a liberalized and privatized market.

In addition to responsibilities on several executive and advisory boards, and his functions at EPON, Mr. Van Halderen was part of Tractebel EGE (Electricity & Gas Europe), responsible for the operational leadership of the various business activities and the development of new electricity and gas projects within Northern and Central Europe.

In January 2002, Mr. van Halderen became CEO of NUON, the leading Dutch energy and water company, with activities in various countries in Europe, North and South America.



Alexis Fries
President, ALSTOM's Power Sector

In 1988 Alexis Fries joined ABB after a number of years with BBC Baden and Motor Columbus Consulting Engineers. In 1993 he was appointed Executive Vice President and Member of the Group's Executive Committee, and became Executive Vice President ABB ALSTOM Power upon the creation of the company in 1998. Mr. Fries was appointed Executive Vice President ALSTOM Power in May 2000. In May 2001, he was appointed President of the Power Sector, and is a member of ALSTOM's Executive Committee.

ALSTOM's Power Sector is one of the world's top three suppliers of power generation services and equipment and is a full-service provider to the industry. Offering a complete range of services, components and turnkey power plants, the company has supplied the equivalent of 20% of the world's total installed power generation capacity.

In May 2000, ALSTOM acquired ABB's 50% share in ABB ALSTOM Power, their joint company, incorporating all of the previous ABB power generation capabilities, with the exception of nuclear. The 100% owned entity is today a new sector of ALSTOM, renamed ALSTOM Power, present in over 70 countries, with more than 50 manufacturing centers. As of 31 March 2001, ALSTOM Power employed 50,000 people and represented 55% of ALSTOM's total sales. *

TE'02 KEYNOTE SESSION:
9:30am – 12:00nn on Monday, 3 June

TURBO EXPO '02 Leadership



AWARD WINNERS

*To be honored at the Awards Dinner
 Monday evening at the Okura Hotel
 Some tickets available.*

R. Tom Sawyer Award:

Philip C. Ruffles, Rolls-Royce plc

Gas Turbine Award:

Thomas Sattelmayer, Technische Universitat Munchen

John P. Davis Award:

Niklas D. Rom, Royal Institute of Technology, Stockholm
 Mats O. Westermark, Royal Institute of Technology, Stockholm
 Michael A. Bartlett, Royal Institute of Technology, Stockholm
 Torbjorn Lindquist, Lund Institute of Technology, Lund, Sweden

Aircraft Engine Technology Award:

Dilip Ballal, University of Dayton

Distinguished Service Award:

William G. Steltz, Turboflow International, Inc.

The following volunteers will be leading the more than 1,000 individuals contributing their time and efforts to organize and bring to completion what promises to be a highly successful TURBO EXPO '02 in Amsterdam this June 3-6. Our special thanks go to them, to our hard working volunteers at all levels, and to the companies who support their efforts.

Executive Conference Chair:

Ron van den Handel

Shell Global Solutions International B.V.

IGTI Chair of Conferences:

Ron Natole

Natole Turbine Enterprises, Inc.

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Andre Mom

Dutch Gas Turbine Association (VGT)



Amsterdam, the Beginning of June and Gas Turbines!

*by Andre Mom, Managing Director, Dutch Gas Turbine Association and
 Chair, ASME / IGTI Local Liaison Committee*

The ASME TURBO EXPO will this year be held in June in the beautiful city of Amsterdam; an event not to miss. The combination of a relaxing spring atmosphere in Amsterdam and the presence of the "fine fleur" of the worldwide gas turbine community make this event special.

The theme of ASME TURBO EXPO 2002 is "Gas Turbines for a Better Tomorrow." And indeed, looking to the achievements made and the achievements still to come in our industry we can really speak of a revolution and a better tomorrow.

The first issue in gas turbine technology is of course **energy conservation**. The continuous increase in turbine inlet temperature, made possible by advanced cooling concepts, the development of new, high temperature materials and the

application of superior (ceramic) coatings resulted in efficiencies of 40% for simple cycle gas turbines and even 60% in combined cycle applications. In the coming years we expect that combined cycle efficiencies will go beyond 65%.

In the aeroengine sector we see similar developments. During the last 30 years we note a nearly 1% **decrease in specific fuel consumption (SFC)** per year. In Europe goals have been set to reduce SFC another 15 - 20 % in the next 20 years.

With respect to gas turbine emissions, similar developments have taken place. While in the past NO_x emissions were well above 100 ppm, nowadays the current population of gas turbines emit around 40 ppm. The newest gas turbines now entering the market have emission levels even



Exhibitor at work

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EXPOSITION:

3-Day Event ... June 3-5

Free passes available in the Registration Area for industry personnel. You may also register in advance. If registering to visit the Expo only, you may also attend the Keynote Session on Monday morning 9:30am to 12:00nn.

Exposition hours:

Mon. 12:00nn – 6:00pm
 Tue. 10:00am – 6:00pm
 Wed. 10:00am – 4:30pm
 Thur. Exposition Closed

REGISTRATION DEADLINE: May 3

Form on IGTI web site at: www.asme.org/igti/
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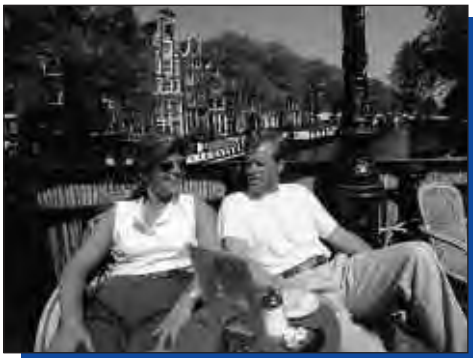
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at: www.asme.org/igti/. You can also receive automatic e-mail notification of updates to the TE'02 site by signing up for the IGTI "E-Bulletin" service.



Relaxing along the canal.

below 10 ppm. So developments are coming fast, mandated by government regulations in various countries, but also made possible by an engine community that realizes environmental goals are an asset in today's energy market.

The advantage of **low NO_x emissions**, apart from the obvious environmental reasons, is that the exhaust emissions can be used directly in greenhouses for heating, for CO₂ fermentation and for other purposes. A high NO_x level would impede the direct use of exhaust gases.

A third issue is **noise reduction**. Especially in the aero-engine market where noise is a major concern, developments are directed toward noise suppression systems that effectively reduce a plane's noise footprint during take-offs and landings. This is a topic of supreme importance because air traffic is rapidly increasing and airports usually lie in densely populated areas.

Finally, a lot of focus is on the use of **alternative or renewable fuels**. Gas turbines are *the* machines which are able to burn a wide range of liquid and gaseous fuels within the environmental limits set. Current R&D work focuses on the burning of gas from biomass, gas from landfills, sewage gas, by-products of chemical plants, flare gas, etc. Also, the rapid growth in the market for small gas turbine systems is partly related to the use of these alternative fuels.

All the above developments will be addressed at the ASME TURBO EXPO in Amsterdam this June: in the Technical Congress with well over 600 papers to be presented, in the Gas Turbine Users Symposium with 30 panel sessions and tutorials, and on the Exposition floor itself. *

Be welcome and join us 3-6 June in Amsterdam!

Hot Topics at Turbo!

With so many sessions scheduled over the four days of TURBO EXPO, here are just a few of the ones to look for, listed by session organizer. Days noted below are tentative. Consult the final schedule to be announced on the IGTI web site for exact days and times.

- ❖ Rainer Kurz's GTUS tutorial "Gas Turbine Fundamentals and Applications" (Monday) presents the basics of gas turbines to those seeking an understanding of how gas turbines work, gain insight into performance evaluation, and understand gas turbine applications. Dry-Low-NO_x combustion and cooling concepts are covered.
- ❖ Loredana Magistri's session "Fuel Cells & GT Hybrids I," and Maria-Teresa Basurto's session "Fuel Cell Hybrid Systems II" (Monday) present an opportunity to explore novel systems. Presentations on the use of high temperature fuel cells in combination with microturbines to yield high efficiency, small size units for distributed power generation. Mitsubishi, Rolls-Royce and Siemens Westinghouse pilot plants will be discussed.
- ❖ Dilip Ballal and Riti Singh's panel "Role of Engineering Societies in Developing Gas Turbines for a Better Tomorrow" (Monday) will have top Engineering Society officers and industry executives discuss educational challenges and the future need for gas turbine engineers.
- ❖ Abbie Layne's panel "Advanced Gas Turbine Developments and Operating Experiences" (Tuesday) will discuss utility scale advanced technology gas turbines resulting from the ATS (Advanced Turbine System) DOE/Industry Partnership Program. First operational experiences as well as results from maintenance inspections will be reported.
- ❖ John Brushwood's paper session "Alternative Fuels" (Tuesday) will look at an area of increasing interest ... using low BTU fuels to power gas turbines. Although difficult technologically, there are important implications for the chemical and coal industries.
- ❖ Manfred Klein's GTUS "Combustion and Emissions Tutorial" (Tuesday) will look at basic gas turbine combustion, why emissions occur, how standards are written, and the costs and benefits of various control strategies. Leslie Witherspoon's panel "Air Pollution and Hazardous Emissions from GT Plants" (Tuesday), and her panel "Greenhouse Gas Prevention Opportunities" (Wednesday), will address environmental issues with global impact and offer a forum for industry leaders and experts to discuss solutions.



- ❖ Scott Samuelsen's paper/panel "Gas Turbine / Fuel Cell Integration" (Wednesday) is an update on the intriguing technology of turbo fuel cell hybrids. These systems have the potential of greater than 70% efficiency, less than 1 ppm NO_x, no SO₂, and sizes up to 50 MW.
- ❖ Jim Sorokes' session "Centrifugal Compressors-Diffusers and Volute Effects on Stage Performance" (Wednesday) will examine the effects of differing types of inlets and diffusers at both design and off-design flows.
- ❖ Carlos Arana's panel "Future Trends of Combustor Technology" (Wednesday) will discuss limitations and potential breakthroughs in areas such as design tools, combustion instabilities, reliability, technologies for 1 ppm NO_x or less, combustion of MBTU fuels, and NO_x reduction methods for aeroengines and for CTs using liquid fuels.
- ❖ Kostas Mathioudakis' session "Engine Diagnostics I" (Wednesday) will feature detection and isolation of gas turbine performance faults. Methodologies range from "classical" modeling and algorithms to more "empirical" approaches. This will provide a broad perspective on possible approaches to engine performance tracking.
- ❖ Aly El Shafei's panel "Condition Monitoring & Machinery Diagnostics" (Thursday). Today, new special tools are needed to measure the health of a gas turbine system. Panelists will discuss new tools that help you decide how to manage an engine in accordance with its present condition.
- ❖ Jill Jonkouski's panel "Ceramics for Stationary Gas Turbines" (Thursday) will present an overview of cutting-edge research and novel uses of ceramics in land-based gas turbines leading to improved operating efficiencies, reduced emissions, and improved diagnostics. *

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Basic Gas Turbine Metallurgy AND Repair Technology Workshop

Hosted by the IGTI Gas Turbine Users Symposium (GTUS)



*Learn from
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Operations and Maintenance Personnel Learn ...

- *About gas turbine metallurgy and repair technology!*
- *How to choose replacement parts!*
- *How to do business with gas turbine repair shops!*

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Typical gas turbine metallurgy, repair processes, coatings and quality control. Accompanying CD-ROM included for use during class and future reference. Bring your laptop.

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GAS TURBINE LOCOMOTIVES— A HISTORY: PART I

by Holger Lukas, Consultant

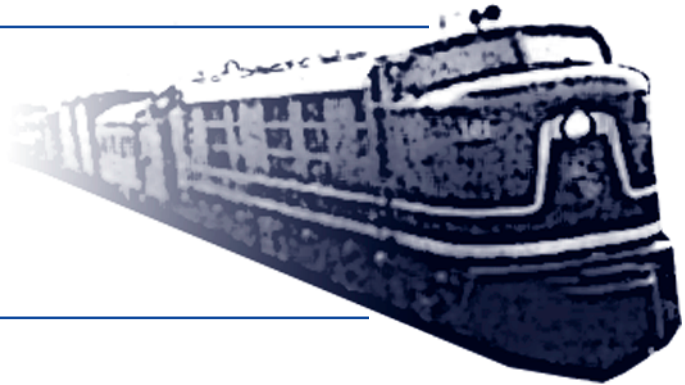


Figure 1. Experimental Swiss Gas Turbine Powered Locomotive ¹



Figure 2. Brown Boveri Locomotive for Great Western Railway (1950) ²

High-speed rail service and gas turbine powered trains have been touted recently as the wave of the future for passenger rail travel. In the United States, the high-speed Acela train for the “northeast corridor” and the repowering of the Empire Corridor Turboliners have garnered much public attention.

Gas turbine powered trains, however, are not new. The first gas turbine locomotive was built in Sweden in 1933. It used a diesel motor as a hot gas generator and drove a 550 horsepower turbine. Three additional units using the same principle were built in the late 1950’s. These were experimental units and never entered production.

The history of gas turbine powered trains can be divided into two overlapping periods. In the first of these periods the large, heavy-weight industrial gas turbine was used as a power source. In the second, small, light-weight aeroderivatives were preferred. This article will concentrate on the first period while a future article will address the second.

Brown Boveri of Switzerland (now Alstom) brought out the first gas turbine powered locomotive in 1941 (Figure 1). This was strictly an experimental unit of 2200 horsepower using a regenerative cycle. In 1943 it entered scheduled service. In 1946 it was tested by the French railways (SNCF), and in 1950 by the German railways (Bundesbahn). The Brown Boveri locomotive remained in service in Switzerland until 1959.

Based on the favorable experience achieved, Brown Boveri received the first commercial order for a gas turbine powered locomotive from the Great Western Railway in England. This unit was delivered on March 10, 1950 (Figure 2). The gas turbine was a 2500 horsepower regenerative cycle unit driving an electric generator (Figure 3). The higher heating value efficiency was 15.8% and the fuel of choice was a heavy fuel oil. This unit operated in scheduled service until 1960.

At this time, Metropolitan Vickers was developing an open cycle locomotive (Figure 4). The arrangement was a typical double-header of the period (Figure 5). While the



TECHNOLOGY

Gas Turbine Locomotive History: Part 1 ... continued

locomotive gave generally satisfactory performance in service, it showed little or no advantage in fuel costs compared with steam locomotives under the same operating conditions. It was retired in 1958.

In the United States the General Electric Company built the second gas turbine powered locomotive to enter commercial service. This experimental unit (Figure 6) proved so successful in tests that in December 1950 the Union Pacific Railroad placed an order for ten locomotives (Figure 7). The first of these units was delivered in January 1952 and was thus the first commercially built gas turbine locomotive in the United States.

The GE locomotive was a simple-cycle unit of 4500 hp driving an electric generator. The higher heating value efficiency was 16% burning a low-vanadium heavy fuel oil. The gas turbine was skid mounted (Figure 8) allowing replacement of the entire unit. The original order for 10 engines was followed by additional orders (Figure 9), eventually bringing the total to 25 locomotives and 27 gas turbines (2 spares). The 4500 hp locomotives were retired in the early 1960's. The units had achieved over 30,000 hours of operation and major repairs were looming on the horizon.

The experience gained through the operation of the 4500 hp locomotives led Union Pacific to purchase, between 1958 and 1961, 30 GE gas turbine locomotives rated at 8500 hp. These locomotives consisted of two units (Figure 10). The first unit contained the engineer's compartment, controls and most of the auxiliary equipment. The second unit consisted of the gas turbine, generator, and fuel pumping equipment.

The 8500 hp GE unit was a simple cycle gas turbine designed to burn residual (Bunker "C") fuel oil (Figure 11). The majority of railroad experience with gas turbines has been accumulated using liquid fuels, primarily residual oil, due to its availability and economic advantage. Operation with residual fuel treated to inhibit vanadium corrosion has led to over 1,500,000 hours of satisfactory operation in rail service.

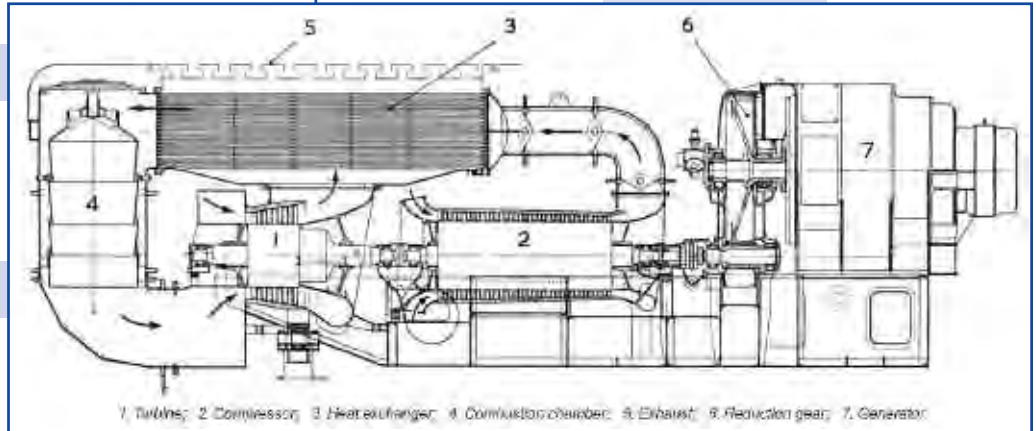


Figure 3. Brown Boveri Regenerative Cycle Gas Turbine ³



Figure 4. Metropolitan Vickers Gas Turbine Locomotive ³

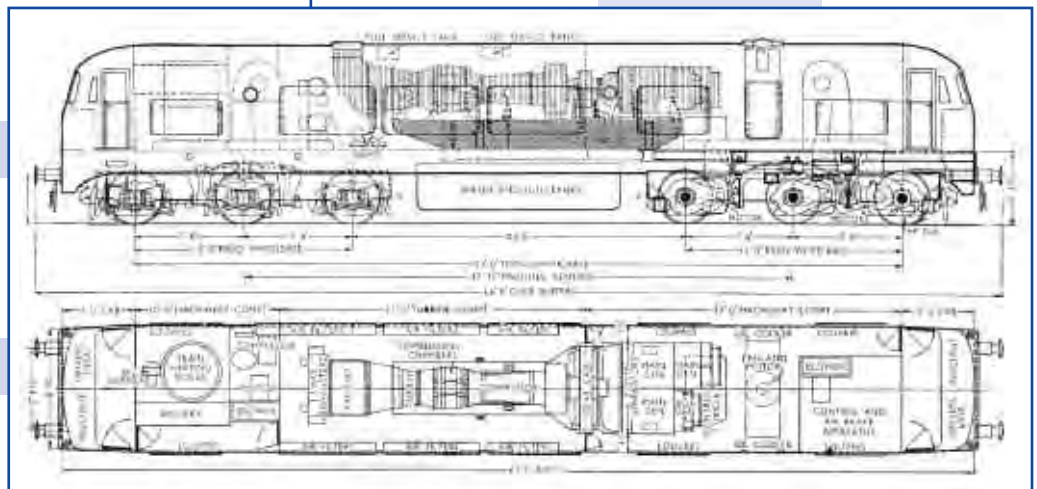


Figure 5. Layout of Metropolitan Vickers Locomotive ⁴



Figure 6. ALCO-GE Demonstrator in Union Pacific Livery ⁵
(© 1950 AIEE now IEEE)



Figure 7. First Generation 4500 HP Gas Turbine Powered Locomotive ²



Figure 8. 4500 HP Gas Turbine used in GE Locomotives ²



Figure 9. Second Generation GE Gas Turbine Locomotive (4500 HP). ⁶

(Reprinted with permission from SAE paper 560221 © 1956 Society of Automotive Engineers, Inc.)

The huge locomotives, with their big appetite for fuel oil, eventually fell victim to the more efficient diesels, and were retired from service by 1970.

General Electric was not the only company actively engaged in gas turbine locomotive design in the United States. Westinghouse, in conjunction with Baldwin Locomotive Works, built a 4000 hp gas turbine locomotive (Figure 12). The power plant consisted of two 2000 hp turbines. One turbine was provided with a waste heat boiler. The steam was used for train service and to heat the residual fuel used in the gas turbine. Some of the steam was injected into the gas turbine to provide additional power. Tests of the unit showed that it could pack twice the power of a diesel into the same space but at double the fuel consumption. However, with diesel fuel being 2.5 to 3.0 times more costly, the gas turbine locomotive was approximately 20% more economical than a comparable diesel engine of its time.

Other countries, including France and the Soviet Union, experimented with gas turbine powered locomotives. Free piston engines as well as single shaft gas turbines were used. All of the tests appeared to be successful. The future of the gas turbine powered locomotive looked very "rosy" in the mid-1950's. R. Tom Sawyer, one of the gas turbine pioneers, predicted in 1956 that the gas turbine powered locomotive would be the locomotive of the future. He stated "Of course, the diesel locomotive will be with us many years, but eventually – possibly in the 70's, the gas turbine locomotive, burning all types of fuel, but especially atomic fuel, will take the lead." Unfortunately, for many reasons Sawyer's prediction did not materialize. Speed restrictions on the railways, improvements in diesel engines, electrification of rail lines, changes in relative fuel costs, and the use of heavy duty gas turbines all helped delay the introduction of gas turbine powered trains.

Where gas turbine power had a distinct advantage over diesel engines, and in some instances electrically powered trains, was in speed. Gas turbine powered locomotives could pull a greater quantity of cars at higher speeds. Diesel electric trains, due to the reciprocating motion of their engines, were not as suitable for high speed operation.

Light-weight aeroderivative gas turbines were introduced to rail service in the mid-1950's. A future article will cover some of these units. *



TECHNOLOGY

Gas Turbine Locomotive History: Part 1... continued

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Figure 10. 8500 HP Gas Turbine Powered Train ⁷

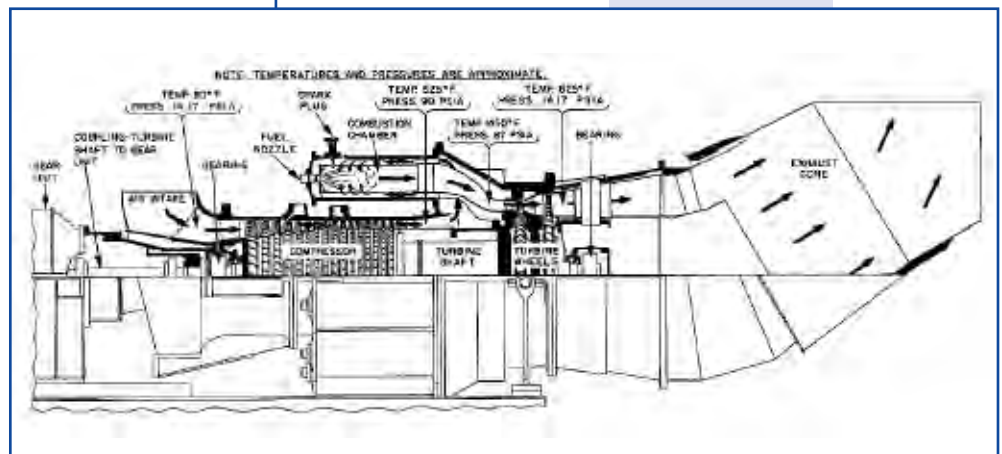


Figure 11. General Electric 8500 HP Gas Turbine ⁷



Figure 12. Westinghouse-Baldwin 4000 HP Gas Turbine Locomotive ⁸

(Photo courtesy of Turbomachinery International Publications)

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James St. Peter is a Technical Historian contracted by the Air Force to research and write this historical look into the development of aircraft gas turbine engines in the United States. He was ideally suited for this landmark project because of his in-depth knowledge of jet engines and previous research experience.

St. Peter was selected by the Air Force Wright Laboratory, Aero Propulsion & Power Directorate, at Wright-Patterson Air Force Base in Dayton, Ohio. The effort was co-sponsored and financially supported by the Army, Navy, Air Force, NASA, and the ASME International Gas Turbine Institute.



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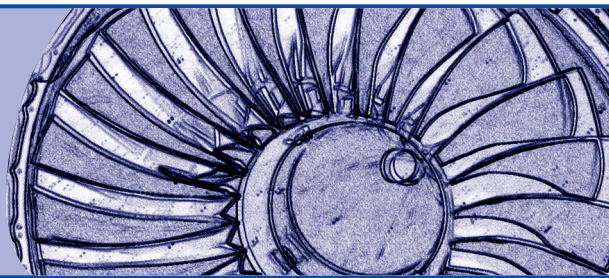
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JOURNAL OF ENGINEERING FOR GAS TURBINES AND POWER



Lee Langston

Important News from Lee Langston, Editor

Authors associated with IGTI form the largest group of paper contributors to the *Journal of Engineering for Gas Turbines and Power* (POWER). About 75% of the papers published in POWER come from IGTI's TURBO EXPO Technical Congress. Because so many *Global Gas Turbine*

News readers are contributors to the writing, reading, reviewing and processing of POWER papers, let me give you a short status report on Journal affairs. I do this, with a less-than-one year tenure, having assumed the editorship on July 1, 2002.

Currently POWER is suffering from success in that the Journal has a significant paper backlog. Published quarterly (January, April, July and October) the Journal is allocated 950 pages per year by the ASME Publications Committee. Based on the new ASME nine-page limit (up from six) for paper length, a lower limit of 105 papers per year could be published (not counting table of contents, instructions and other necessary housekeeping pages).

Most papers are less than the nine-page limit, so the Journal actually publishes 110–130 papers per year. Roughly 30–50 of these come from direct submissions to the Journal, with Associate Editors handling the reviews. The remainder come from IGTI's annual TURBO EXPO Congress where the review process is carried out by IGTI Technical Committees (with follow-up where necessary by Journal Associate Editors). About one-third of the TURBO EXPO Congress papers presented are recommended for journal publication.

As I write this, Judith Sierant, ASME Production Coordinator, has finished putting together the April 2002 Journal issue. This issue contains the last of the papers from TURBO EXPO'00, presented in Munich in May, 2000. Thus, one can say the current backlog in POWER is just under two years, based on date of presentation of the papers. This backlog shows that there is a great deal of research activity in power technology (e.g. new developments in gas turbines, electrical power deregulation). However, the prospect of waiting up to two years for publication after presentation is not an acceptable situation. As the new editor I've taken two steps to reduce this publication time:

1. I have asked the ASME Publications Committee for an increased allocation of 300 pages, bringing the Journal to 1250 pages per year. This is an obvious solution, but it will be weighed against the Committee's responsibility to the Society to keep publication costs within bounds.¹ Publications Committee action on this request is pending.
2. In the last issue of *Global Gas Turbine News*, Ted Okiishi, the Editor of our companion ASME publication, *Journal of Turbomachinery* (TURBO), wrote that TURBO had a backlog of less than a year (good), but noted the backlog is shrinking (not good). Ted and I have consulted to see if, where appropriate, some papers slated for POWER could be published in TURBO. This would contribute to both ASME journals, decreasing the backlog in one and filling allocated journal pages in the other. Ted and I will meet with the appropriate IGTI Technical Committees at TURBO EXPO '02 in Amsterdam in June to discuss this possible solution.

Let me end my short status report by summarizing that the state of the *Journal of Engineering for Gas Turbines and Power* is good. I welcome any ideas or comments from *Global Gas Turbine News* readers on the backlog issues presented here. I append to this invitation for comment, two faintly cautionary quotes:

"Do you want it fast or good?" (A Hollywood producer.)

"There is always an easy solution to every human problem—neat, plausible, and wrong." (H.L. Mencken)

I look forward to hearing from you.

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¹ As an interesting bit of ASME history, consider this past Committee announcement in the 1891 Transactions, Vol. XII: "The increasing bulk of the annual volume of *Transactions* has induced the Publication Committee to discontinue insertion of the full list of members among the preliminary matter therein." (One wonders if this led to a few bruised egos among early Society Members.)



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2002 EDITION

by Lee Langston
University of Connecticut
Editor—Journal of Engineering
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