

ROVSING Dynamics is a leading supplier of Predictive Maintenance Information Systems and associated services to industries using rotating machinery, such as the Power Generation, the Petrochemical and Marine Industries.

Through our product OPENpredictor™ we enable our customers to increase revenue while decreasing operation and maintenance costs.

ROVSING Dynamics supply and service an international market from the headquarters in Denmark. Furthermore, local offices, agents and distributors represent us in a number of countries worldwide.

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Editorial

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Thea Larsen, M.Sc.E.E.
Managing Director

Frequent snow showers and spring still weeks away – the season offers many good excuses for cuddling up in the warm or lingering off in daydreams of milder places....

For ROVSING Dynamics this is however not the case. This winter has been a very exciting season for us, with much increasing interest for OPENpredictor™ and our remote diagnostic services. We have initially focused our marketing efforts on the power industry and have today established a strong base in Europe. During the last year we have worked extensively and in close co-operation with our skilled partners to emerge in the Asian markets and we are now harvesting those early fruits. We are also receiving notable attention from other new industry sectors, like Oil and Gas, where we have only recently made approaches. Since OPENpredictor™ is suited for all capital-intensive businesses where the risk of reduced availability combined with volatile commodity prices represents a serious business threat, the potential is huge.

I am also proud of our recent and strategically important orders from within what are new markets and new industries for us, as they were awarded after very serious and thorough evaluations of OPENpredictor™ against alternative solutions. ROVSINGDynamics was selected not only due to our product superiority but also due to the competence and professionalism of the dynamic team behind it.

By combining innovation with field experience our team is constantly working on enhancing our products and improving our services. The next OPENpredictor™ software release will offer new diagnostic methods, giving even better opportunities for planning and optimization based on reliable machine health information. Whilst our remote diagnostic support centre will continue to support you with targeted information and drill-down analyses, pinpointing likely machine health problems.

We are looking forward to servicing you through a hopefully warm, sunny and even more exciting spring season, where ROVSING Dynamics reaches for new goals in a challenging international market place.

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The Customer Care Program

- Training focused on benefits for the Customer Organisation

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Author: Ole Døssing, M.Sc.M.E.

Technical Director,
International Publications: Approx.
30 technical papers and articles.
Honorary Office Member of several
ISO working groups
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Vibration Association (SVIB).
External examiner: Denmark's
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Guest Speaker at several
international conferences on
mechanical systems, structural
dynamics and signal processing.

In October 2003 ROVSING Dynamics developed a Customer Care Program (CCP) in order to pursue the company's customer-focused policy.

The principal intention of the Customer Care training was, and is, to convey the philosophical aspects of predictive maintenance, to point out the benefits achievable from the continuous information harvest and to provide demonstrations of how superior OPENpredictor™ is in providing the information to support maintenance and operation decisions.

Training Focused on Benefits for the Customer Organisation

The first training sessions took place in the beginning of 2004 at the plants **Rya Heat Pump Plant** (Göteborg Energy Group, Sweden), **Viborg Heat & Power Plant** (Municipality of Viborg, Denmark) and **Damhead Creek Power Station** (Entergy, UK) and were great successes.

The scope of the training comprises an introductory background in predictive maintenance and the role of OPENpredictor™ in this context, as well as an in-depth insight into the system applications and practical training for the operating and maintenance staff. Finally, offering specialist training in diagnostic practice where staff with appropriate background and interests are present. The training focuses on benefits for the organisation.



Above: Participants at a training session at Rya Heat Pump Plant in Sweden, March 2004

The intended audience is plant Operation and Maintenance Management personnel and the content of the program can vary depending on customer needs and skills. Typical examples of agenda topics are: principles of health monitoring, review of possible benefits, introduction to benefit assessment, spare part management, introduction to service reports, introduction to diagnostics, training in system management and data presentation, how to review results of AutoDiagnosis™ and discussions and clarification of special local issues, to mention a few.

Having attended a training session one of our customers is already considering adding OPENpredictor™ to a number of additional machines.

Who benefits from the Customer Care Program?

Precisely answered: Everybody. The aim of the Customer Care Program is to achieve a win-win situation; customer satisfaction leads to recommendation of the OPENpredictor™ solution to other stakeholders, such as colleagues and user groups with similar interests.

Furthermore, CCP is a continuous process intended to provide our customer with up-to-date knowledge about processes and products. Participants will also be given the opportunity of meeting other users at User Group seminars once a year in order to enhance their knowledge and exchange experiences.

The seminars are being put together with plans for a different kind of experience and form part of our strategy to ensure long-term benefits are achieved through the Customer Care Program.

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Diagnosis is not only for Human Beings

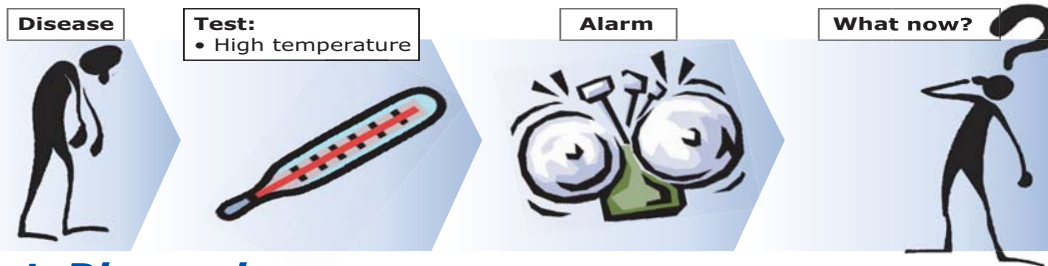
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What is AutoDiagnosis™?

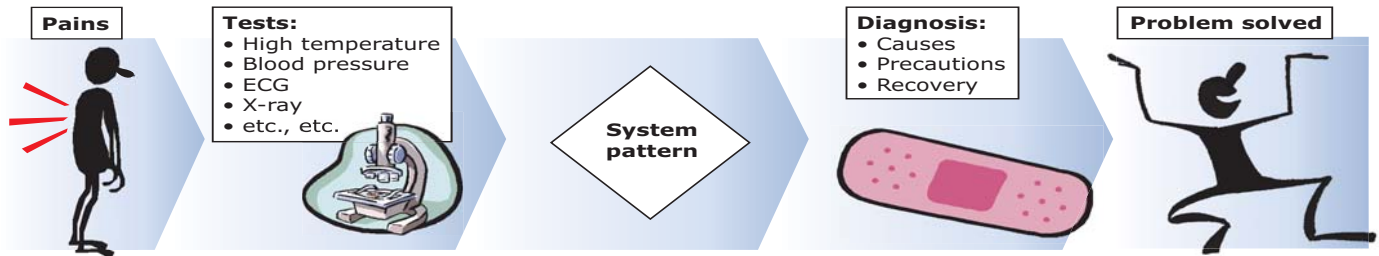
AutoDiagnosis™ is a software system designed to detect and localise faults developing on rotating machinery and if found to be serious, warns and advises the user, e.g. the plant operator. AutoDiagnosis™ is a predictive maintenance system working on top of the normal monitoring, measuring and alarm systems of OPENpredictor™. The advanced signatures of OPENpredictor™ are used in combination with AutoDiagnosis™ for extraction of the necessary information to evaluate potential faults and to make the diagnosis – advising the plant operator on the health of specific machinery.

Below: the principle of the AutoDiagnosis™ System can be illustrated by an analogy about a human disease:

Traditional Condition Monitoring



AutoDiagnosis



In the above example, the diagnosis is made by analysing tests performed on the patient and comparing the results with the symptom patterns for potential diseases. The challenge to be met by the diagnosticians is to identify sufficient symptoms which can then serve as solid test data. Thereafter carrying out ongoing tests to detect the symptoms of the potential diseases, in order to separate the correct disease from others with almost identical symptoms.

The AutoDiagnosis™ fault library consists of specific signatures; in order to stay in the disease analogy we can call them “diagnosis and prescriptions”, for identification of each fault or “disease” covered by the system. The diagnosis ensures detection of the fault and disclosure of other faults with similar symptoms. In practice, each diagnosis is coded in a script language that determines which measurements and component data to retrieve from the database and how the important information is extracted. The script is executed by a separate application that also performs statistics on the historic results and sends the relevant notification to the user.

Read more about the **Predictive Maintenance Strategies** in the article [“The RCM Philosophy – How to save large amounts on the maintenance strategy”](#)

To learn more about AutoDiagnosis™ contact: +45 4420 0837 or mail info@rovsing-dynamics.com

Due to its extensive diagnosis features, AutoDiagnosis™ is an obvious choice to assist with attaining a full Predictive Maintenance Strategy. A Predictive Maintenance Strategy is based on measuring the condition of specific equipment in order to assess the risk of future failure and identifying appropriate actions in order to avoid the consequences of any unforeseen machinery outage.

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New Strategic Orders – BP and Hitachi

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ROVSING Dynamics Enters New Markets with Great Potential

Having received orders from British Petroleum, Nederland (BP) and Hitachi, ROVSING Dynamics has now entered both the Oil and Gas and Japanese markets.

BP evaluated a number of condition & performance monitoring products in order to find the most suitable system for the purpose of monitoring the performance of BP's gas compressors in the North Sea, their selection was OPENpredictor™ from ROVSING Dynamics. OPENpredictor™ was found to be the most powerful application under consideration as well as the most suitable due to the integration of the performance and mechanical machine-monitoring module.

With BP's significant experience in monitoring rotating equipment, being awarded this contract is seen as a clear confirmation of OPENpredictors™' high standard.

The Door opens to the Japanese Market

Another international conglomerate that has selected ROVSING Dynamics' system in preference to a number of competitors, is Hitachi, the Japanese technology giant.

Like BP, Hitachi has performed a detailed study in order to evaluate which system to use as a platform for their remote monitoring services, specifically for monitoring the large number of turbines owned and/or maintained by Hitachi. OPENpredictor™ was selected due to its advanced functionality in addition to the options it provides for remote machine monitoring via the Internet.

*By Kåre M. Rasmussen,
CRM Coordinator*



Right: production of an ACR 700 turbine, based on Hitachi design

ROVSING Dynamics' ongoing business development of the Japanese market has further resulted in continued communication with another potential future partner.

Benefits for New and Existing Customers

Experiences gained from the cooperation with British Petroleum and Hitachi will be incorporated into both our work processes and product development and thereby benefitting all ROVSING Dynamics customers. Grounds for acquisition of this experience are extensive when taking into consideration the number of gas compressors BP have in the North Sea and the 70 gas turbines and several hundred steam turbines that Hitachi has in operation.

Ready to take up new challenges

ROVSING Dynamics expects the new installations ordered by BP and Hitachi to be completed during the spring 2004 and hereafter ROVSING Dynamics awaits the planning of new projects in cooperation with the two conglomerates.

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How to save money with your maintenance strategy: Predictive Maintenance and Reliability Centered Maintenance

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Author: Jan Wäehrens,
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Predictive Maintenance Analyst

To achieve maximum operational reliability at the lowest costs is a necessity in the energy business of today. In this context the concept of Predictive Maintenance or Condition Based Maintenance often turns up as an effective method of achieving this goal. But what is Predictive Maintenance and from where does this idea originate?

If you search the Internet for the meaning of Predictive Maintenance you will soon find following definition:

Predictive Maintenance:

Is an equipment maintenance strategy based on measuring the condition of equipment in order to assess whether it will fail during some future period and then taking appropriate action to avoid the consequences of that failure.

The condition of equipment could be monitored using Condition Monitoring, Statistical Process Control techniques, by monitoring equipment performance or through the use of the Human Senses.

The terms Condition Based Maintenance, On Condition Maintenance and Predictive Maintenance can be used interchangeably.

This definition is quite clear, but probably not more than 20-30 years old in its origin. However, the idea behind Predictive Maintenance; to monitor or inspect equipment in order to assess whether it will fail while it is required to fulfil its purpose, must be as old as man himself. Who would not check his weapon before he went to war, who would not check his carriage before he would use it for a long journey?

Nowadays Predictive Maintenance is, as the definition says, a maintenance strategy which is more and more used in continuous operating production facilities as it has several advantages. This maintenance strategy is recommended among other maintenance philosophies by the Reliability Centered Maintenance philosophy, RCM.

The RCM philosophy is defined by the Aviation Industry. Particularly in this industry it is vital to optimise the maintenance of the aircraft, since the consequences of failure may be fatal.

Below: a steam turbine
belonging to one of ROVSING
Dynamics' customers in the USA

It is difficult to describe in a few words the complete, logical and systematic approach to maintenance behind the RCM philosophy. It is clear, of course,

that RCM is focused on reliability. This means that maintenance aiming to avoid future failures of equipment/components should be based on actual failures experienced in the past on the same equipment/components. Another very essential part of RCM is that any maintenance action (not to be confused with repair of faults) must be evaluated

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in relation to the operational consequences of a failure caused by not carrying out this maintenance action. The fathers of RCM, F. Stanley Nowlan and Howard F. Heap, express it in the following way:

If a failure has operational consequences, scheduled maintenance is desirable if its cost is less than the combined costs of the operational consequences and the repair of those failures it prevents.

In order to avoid failures and their consequences, RCM defines only four types of scheduled maintenance activities:

1. Inspect a component in order to detect a possible failure
2. Overhaul a component before the end of its useful lifetime
3. Replace a component before the end of its useful lifetime
4. Test the function of a component in order to detect a hidden failure

Based on the experience from the Aviation Industry the scheduled maintenance activities 2. Overhaul and 3. Replacement, is only efficient for components that have a well defined useful operational lifetime. For components with a more stochastic failure pattern the scheduled maintenance activity 1. Inspection is the most efficient.

A Predictive Maintenance strategy is a strategy that uses all kinds of inspection techniques and methods to try to detect possible failures, rather than overhauling or replacing components in order to avoid failures.

In this sense RCM appears easy to understand, but the execution of RCM requires hard work in the many disciplines and practical aspects of maintenance planning and execution.

Below: a gas turbine belonging to a ROVSING Dynamics customer in Brazil.



In relation to the Operation of Power Plants (and many other production facilities),

there are many direct as well as indirect costs associated with maintenance. Maintenance carried out in an attempt to avoid failures, additional costs caused by the failures themselves and some failures that cannot be prevented even with attempts to avoid them. There are also many costs connected to minimising the economical consequences (costs/losses) of failures that will nevertheless occur.

The various costs listed in the

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table below are typical prime items. If these items were further broken down into all related and derived costs, the list of effected accounts would be almost endless.

Costs/losses caused by failures/damages	Costs to prevent failures/damages
<ul style="list-style-type: none"> - Lost Income - Power Replacement Costs - Repair Costs - 	<ul style="list-style-type: none"> - Scheduled Preventive Maintenance - Inspections - Condition Monitoring - Service Agreements -
Costs to minimise the economical consequences (costs/losses) of failures	
<ul style="list-style-type: none"> - Production loss Insurance - Machine damage Insurance - Service agreements- "Hot" Stand-by production facilities - 	

Once the failure prediction is made for the components and potential failures where a Predictive Maintenance strategy is applied, then, in due time, remedial action can be carried out (the necessary maintenance/repair tasks). If you are successful, this is the largest single way to reduce all of the above mentioned costs except for the costs of the systems, methods, tools, etc. used to predict the failures.

There are plenty of existing techniques for prediction of failures on machines and components in Power Plants. These techniques vary a lot in methodology, selectivity, sensitivity, the degree of automation in use, for use off-line or on-line, continuous or sampled measurements, etc., methods which cannot be easily compared or benchmarked. There is however, a great potential for maturity of known methods as well as development of new methods for practical use. Vibration monitoring is one of the most widespread and recognized methods of PdM and is accountable for almost 50% of the savings achieved by predicting failures.

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ROVSING Dynamics' OPENpredictor™ system is a logical consequence of the PdM and RCM philosophy.

The AutoDiagnosis™, a part of the OPENpredictor™ system, predicts and diagnose possible faults and thereby decreases the number of foreseen and unforeseen overhauls.

Read more about the AutoDiagnosis™ in the article [Diagnosis is not for Human Beings only.](#)