In offshore operations reliability and uptime are critical, as any interruptions to operations during charter quickly become extremely expensive. This means that a maintenance philosophy that not only focuses on minimising unexpected downtime, but also on maximising scheduled uptime, can offer real business benefits through better return on assets and improved earning power. With this in mind, smart maintenance planning and systematic risk management should be key elements when choosing a maintenance strategy for offshore operations. A lifecycle solution with an experienced partner is often the most efficient way to implement such a strategy.
The importance of reliability and uptime

In offshore operations, availability during charter is critical. Maximised uptime has a direct effect on the amount of days an operator has to earn revenue. Interruptions in operations not only interrupt production, but they also quickly lead to extremely expensive fees for the operator. Maximising availability should therefore be a key concern for all offshore operators, and this should also be reflected in the maintenance philosophy applied. The focus should be on proactive solutions that have a positive effect on uptime.

Still, unexpected situations can and do arise. A system needs to be in place for handling these quickly and efficiently, with minimum impact on operations. Things to consider are the availability of spare parts and field services when and where needed, what spare parts should be carried onboard, how remote access to equipment is set up, and the ability to access expert advice. A well-planned system is capable of both spotting emerging issues early on and providing fast responses to unexpected situations.

Taking a longer-term view, reliability and uptime form the basis for an operator’s reputation and business. A supplier that can provide safe and uninterrupted production throughout the contract period is one that will also be counted on in the future.
Achieving reliability and uptime

Today, with increasing competition, growing financial pressure and increasingly stringent regulation all making the managing of offshore operations more challenging than ever, the traditional method of calendar-based defensive maintenance combined with a large spare part inventory is not enough to secure a competitive edge.

Performing maintenance according to the equipment manufacturer’s hour-based maintenance programme has been the normal way to ensure equipment reliability. However, since maintenance is not based on real known needs, this leads to a defensive maintenance practice in which maintenance is performed and components changed just in case. Such a maintenance strategy means that a large spare part inventory is needed to not only satisfy the needs of the maintenance programme, but also to cater for unexpected failures that can occur between maintenance breaks.

Another typical challenge with a calendar-based maintenance strategy is co-ordinating the maintenance of different equipment and fitting maintenance breaks in with operational and business needs. Inevitably the service intervals of engines, propulsion systems and electrical and automation systems do not all follow the same schedule. This can quickly add up to quite a few maintenance interruptions over a short period of time, resulting in lost production and high maintenance costs.

A knowledge-based maintenance philosophy

A maintenance philosophy aimed at a positive effect on uptime and reliability should be based on real data and knowledge of the true condition of the equipment. This can be achieved through continuous monitoring and smart maintenance planning. A systematic approach to risk management is also a key part of a maintenance philosophy that aims to maximise the return on assets by maximising reliability and uptime.

A maintenance strategy stemming from a philosophy of maximising return on assets through maximised reliability and uptime should fulfil the following requirements:

- Prediction of condition as key input
- Combined engine and propulsion condition monitoring
- Operational decisions based on the actual condition of the equipment
- Faults identified well before they lead to breakdowns
- Technical assistance and expertise available when and where needed
- OEM spare parts available when and where needed
- Up-to-date information available on installations and equipment
- Class approved.
When thinking about ways to organise and manage servicing and maintenance, the focus should be on proactive solutions that improve both reliability and scheduled uptime. This can be achieved through optimising maintenance so that both planned and unplanned breaks can be kept to a minimum.

Planning in advance is important. With smart planning, it is possible to fit maintenance in with other operations so that they have a minimal impact on business. Servicing drill rigs, for example, can be scheduled between charters so that operations are not impacted. Similarly, by looking at a supply vessels’ itinerary, suitable slots for maintenance can be identified, e.g. during loading, and maintenance schedules can be planned accordingly.

Maintenance planning should ideally start already in the design stage through the inclusion of a certain level of redundancy in the equipment package. Production platforms can be equipped with extra generation capacity relative to the expected power demand. Engines can then be dispatched in such a way that maintenance work can be done one at a time, without interfering with production or causing downtime.

Real data as the basis for predictions
Today it is possible to base maintenance decisions on real facts that make reliable predictions of equipment condition possible. This means improved reliability and uptime, and, ultimately, safer operations.

Dynamic maintenance planning refers to a programme in which maintenance is not always necessarily done according to the original hour-based maintenance schedule, but instead a documented maintenance plan based on the actual condition of the equipment is implemented. Such a maintenance plan also allows flexibility with timing and dates when situations change. As a result, the time between overhauls might even be extended, and/or overhauls can be combined with maintenance of other equipment into a single, strategically scheduled maintenance window.

A key element of dynamic maintenance planning is continuous monitoring. Such a system is a combination of periodic inspections and remote online monitoring of the mechanical condition of the equipment, performance and system efficiency data and other indicators. As data is collected and monitored daily, continuous monitoring can reveal trends for several variables, enabling preventive maintenance before equipment failures take place.

The continuous process of risk management
In order to make operations as productive and efficient as possible, it is essential to ensure that unexpected and changing situations do not hinder performance. The financial losses due to an interruption in operations caused by the failure of a simple electronic component, for example, may be quite out of proportion to the cost of the component itself - not to mention potential loss of reputation, compromised safety and other issues.

The critical nature of electrical and automation systems is often underestimated. The fact is that a failure of a simple component or circuit can pose a risk to the operation of the entire vessel. In recent years, with the move of certain vessel types from classic diesel-driven mechanical designs to modern diesel-electric concepts, reliance on the complex electrical systems that control the vessel’s machinery has dramatically increased.
To ensure smooth and reliable operations, a systematic approach to identifying risks and taking preventive action should be adopted. Depending on the case and the possible consequences of a failure, there are three ways to approach managing uncertainty:

• Reactive – no action is taken beforehand.
• Proactive – when early warning signs are received, proactive actions are taken in order to prevent problems.
• Strategic – when the impact and complexity of the case is high, strategic actions such as system or component redesign are deployed.

Although in some cases a reactive approach is sufficient, the focus should generally be on preventing unpleasant surprises instead of just preparing to react to them when they happen. Risks can only be managed if they are identified and understood in advance, and if plans have been made to manage them.

By adopting a process approach to managing uncertainty, it is possible to understand and stay on top of the various risks that could otherwise go unnoticed. This means revealing hidden risks through investigation, inspection, measurement and system-wide monitoring. Risk management should be a continuous process, in which regular or continuous measurement or condition monitoring forms the basis for continuously reliable operation.

A process approach to risk management includes:
• identifying
• understanding
• categorising failure modes and their effects
• planning
• implementing
• analysing
• adjusting.
From a business standpoint, improving reliability and uptime brings immediate and long-term benefits throughout the lifecycle of a vessel. The immediate benefits come from lower costs and higher earning potential. Safety and predictability are key prerequisites for achieving long-term business success.

- Earning potential from additional days available for production
- More efficient equipment – better managed with lower fuel and lubrication costs
- Improved maintenance cost predictability due to fewer unforeseen breakdowns
- Improved safety due to fewer unforeseen breakdowns
- Improved risk management

Increased revenue, per day: EUR 1.353. Over a 5-year period the increased revenue amounts to MEUR 2.47. The example is based on a typical drillship/rig equipped with 6 x W16V32. (Source: Wärtsilä)
Appendix: Wärtsilä lifecycle solutions

Wärtsilä Lifecycle solutions uses digital innovations and advanced data analytics to create a holistic approach that goes beyond maintenance and servicing. The result is a package that allows operators to focus on their core business and match maintenance to their operations, while Wärtsilä ensures that operations run smoothly, efficiently and in accordance with regulations. Operators can additionally monitor and report their emissions and performance to authorities in real-time, based on data analytics. Wärtsilä’s Lifecycle solutions offer the following benefits:

**Increased and guaranteed availability**
Wärtsilä’s Lifecycle solutions maximise asset availability and minimise the number of unplanned interruptions. Remote online support reduces the time and costs of solving issues affecting equipment availability. Improved planning and dynamic maintenance schedules based on condition enable grouping maintenance into dynamic maintenance windows that reduce downtime. Online monitoring of engines and thrusters focuses on the prediction of equipment condition, and makes proactive activities possible before real maintenance needs occur.

**Optimised and predictable OPEX**
Wärtsilä’s Lifecycle solutions help to optimise and predict OPEX. Optimising service intervals with a focus on condition and efficiency has a direct effect on fuel and lube oil consumption. With the dynamic maintenance schedule, working hours and the number of spare parts used can be reduced, which has a direct effect on operating costs. Co-operation with classification societies reduces the need for separate expensive and time consuming inspections.

**Guaranteed asset performance**
Guaranteed asset performance is a ground-breaking solution that provides guaranteed operational reliability. In practice, this means that performance targets are determined based on measured data, and Wärtsilä can guarantee that these targets are reached and maintained. Measurable indicators can include, for example, availability, reliability and fuel consumption. The agreed targets are reached through automated key performance measurements, optimised maintenance and remote advisory services. Customers in marine and offshore can get real-time support regardless of their location, and the remote service is complemented with on-board advisory services. Condition monitoring and audits, together with a performance improvement plan, increase availability and reliability.
Main benefits
- Guaranteed operational reliability and uptime
- Savings in operational costs thanks to improved and maintained ship efficiency
- Maximised uptime through optimised maintenance and remote support
- Performance improvement plan
- Maintenance cost guarantee
- Long-term cost predictability and shared goals

Optimised operations
Optimised operations offers real-time monitoring and advisory services that maximise efficiency. The solution provides a ship energy efficiency management plan that follows the IMO guidelines. On-board advisory service such as hull performance, engine efficiency or condition monitoring, combined with vessel audits and component condition evaluation, helps identify areas in which performance can be enhanced. Ongoing evaluation and system efficiency upgrades lead to continuous improvement.

Main benefits
- Optimised energy efficiency
- Real-time advisory services
- Long-term cost predictability and shared goals
- Performance improvement plan
- Maximised uptime through optimised maintenance and remote support
- Ship Energy Efficiency Management Plan (SEEMP) in compliance with MARPOL (marine pollution) regulations
- Global and local co-ordination through network companies with workshops and skilled service experts

Optimised maintenance
Optimised maintenance involves planning and scheduling maintenance procedures to suit the customer’s business operations, improving long-term cost predictability and uptime. In addition, Optimised maintenance offers remote operational and technical advisory services, whenever and wherever needed. Optimised maintenance is a proven way of preventing the unexpected and optimising an installation’s availability throughout its entire lifecycle.

Main benefits
- Maintenance cost and service level assurance
- Long-term cost predictability and shared goals
- Maximised uptime through optimised maintenance
- Remote operational and technical support
- Scheduled work and parts included
- Global and local co-ordination through network companies with workshops and skilled service experts
- OEM spare parts and consumables – anytime, anywhere
Ensuring your lifecycle operations

Wärtsilä is an experienced lifecycle solution provider, with a proven track record in operation and maintenance services since the 1990’s. Globally, more than 300 ships are covered by Wärtsilä’s lifecycle solutions.

Wärtsilä’s extensive global service network and efficient spare parts logistics ensure that you can focus on your core business, resting assured that your maintenance needs can be optimally met, whenever and wherever.