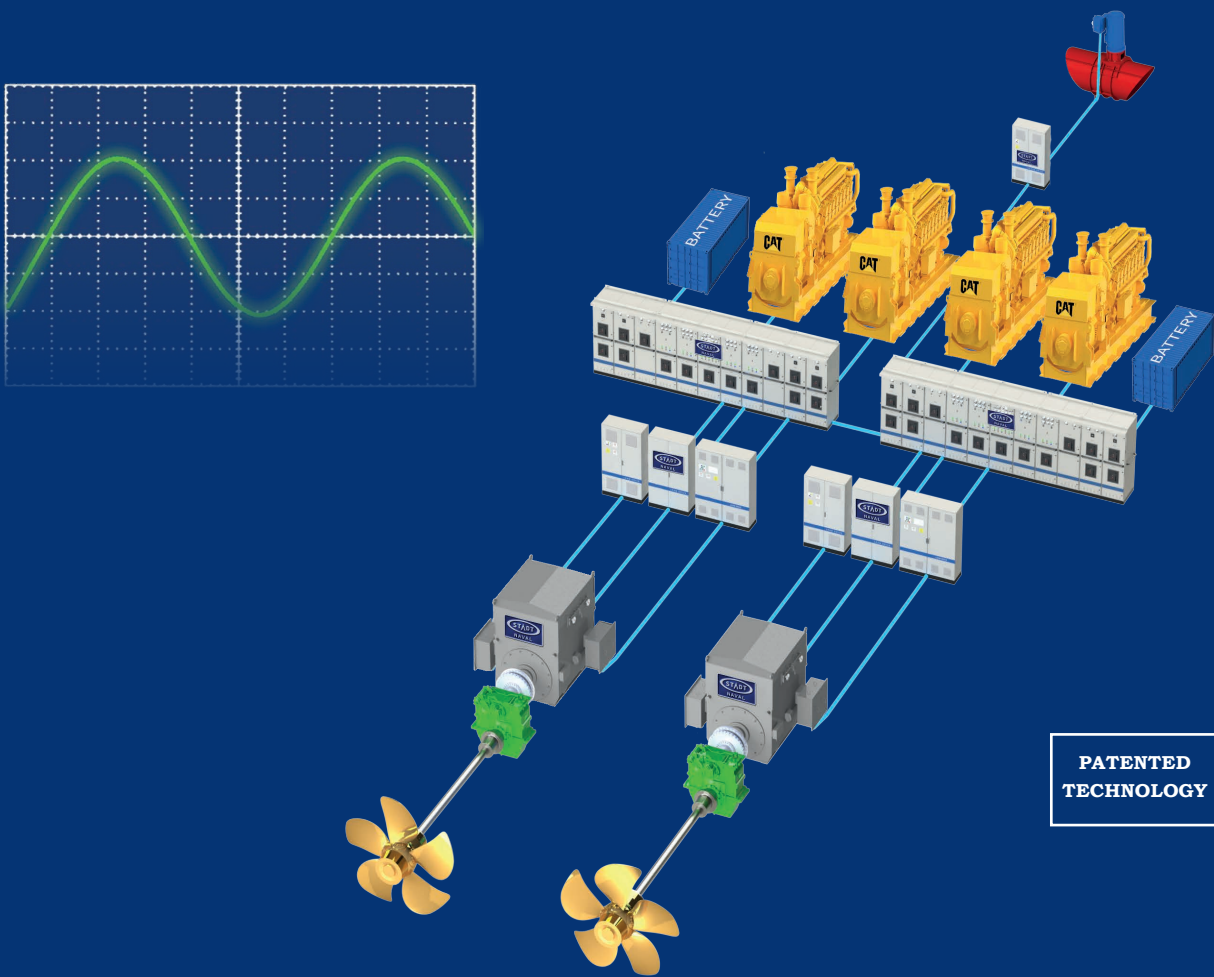




# SINUSOIDAL POWER MAKES A GREAT DIFFERENCE

IN ANY NAVAL & RESEARCH SHIPS



Lean Propulsion®



*Sinusoidal power leads to*

## **STEALTH OPERATION**

Most electric propulsion systems are noisy and create different kind of undesirable noise such as electromagnetic distortion. Stealth is crucial for naval fleets to ensure operational effectiveness, survivability, and strategic options, making it a vital aspect of modern naval warfare.

**STADT** will provide you with the holistic view to design and choose components in combination to STADT Lean Drive to meet the requirements for noise free propulsion.

## **LABORATORY RESEARCH**

Extensive tests and measurements have been conducted on STADT Lean Drive in STADT Test Laboratory as part of a Research and Development project in cooperation between STADT and Norwegian Defence Material Agency.



## **PROVEN AND DOCUMENTED RESULTS**

- ▲ **No Electromagnetic interference (EMI)** detected when operating the STADT Lean drive in STEALTH mode.
- ▲ **No Harmonic distortion (THD)** found when operating the STADT Lean Drive in STEALTH mode.
- ▲ Acoustic measurements on a sailing ship show that STADT Lean Drives create a very low level of **Underwater radiated noise (URN)** compared to other vessels with PWM electric propulsion that has been measured at Norwegian Navy Test Station.

## **GAINS FOR VESSELS AND FLEETS**

- ▲ **Silent vessel with low URN**
- ▲ **Ability to operate closer to enemy**
- ▲ **Conduct reconnaissance missions**
- ▲ **Respond to threats effectively**
- ▲ **Launch surprise attacks**
- ▲ **Reduce probability detection**

### **AC GRID**

the only alternative for  
STEALTH operation



*Sinusoidal power leads to*

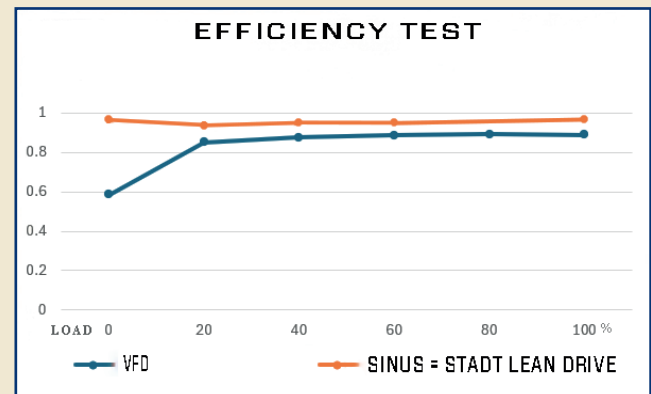
## EFFICIENT OPERATION

In general, electric power loss has been and still is a challenge in most electric propulsion solutions on the market. However, operational efficiency and long endurance at sea is a must have in any future concept of operations for Naval fleet.

**STADT Lean Propulsion®** is a unique technology designed to minimize fuel usage by maximizing the efficiency of energy conversion. That will allow vessels to extend range and length of missions, with same amount of fuel.

## LABORATORY RESEARCH

Tests and measurements have been performed on the efficiency and electric power loss in Lean Drive, comparing sinusoidal drive technology to PWM-based VFD technology. Tests have been conducted at STADT Test Laboratory in cooperation with The Royal Norwegian Navy Material Agency and as part of European Defense Fund (EDF) project (HEGAPS).



## DOCUMENTED RESULTS

▲ When running in STEALTH mode the **STADT Lean drive operates with less than 0,1 % electric power loss, making it the most efficient AC drive in the market.**

## OWNERS GAINS

- ▲ **Lower fuel consumption up to 30-40 %** for vessels with a variable operation profile
- ▲ **Longer operations without refueling** - extended missions
- ▲ **Better acceleration and maneuverability**
- ▲ **Less emissions** - meet environmental standards
- ▲ **Reduced likelihood of mechanical failures**

By focusing on minimizing power loss, a naval fleet can enhance its operational capabilities, reduce costs, and improve overall effectiveness.



*Lean Propulsion® leads to*

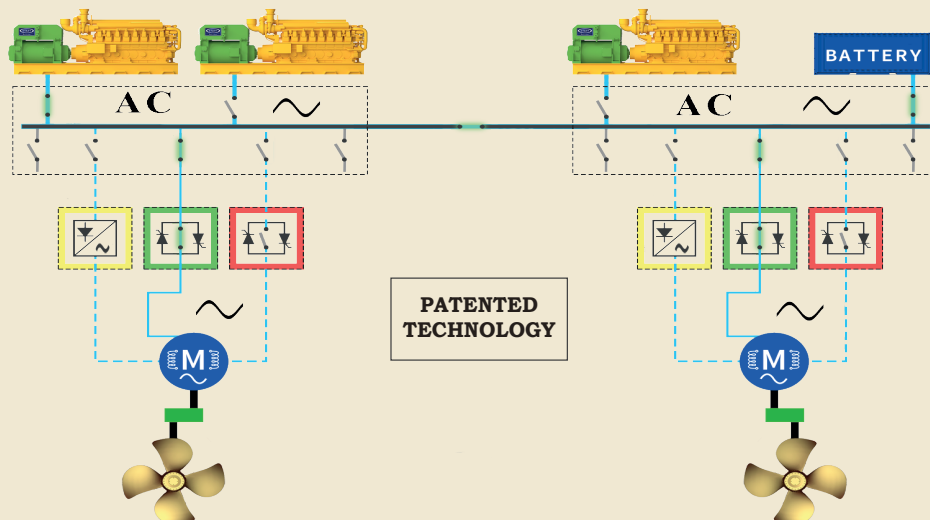
## RELIABLE OPERATION

Naval vessels must be prepared to respond to a variety of situations immediately. Therefore, reliable propulsion is fundamental for effectiveness, safety, and operational readiness for naval fleets.

STADT Lean Propulsion® is highly reliable and ensures longer life time and fewer breakdowns, reducing maintenance costs and secure operation with no downtime.

## STADT LEAN DRIVES ENSURE

- ▲ Triple redundancy per propeller - that guarantees NO STOP in operation.
- ▲ 3 parallel power- lines in each Lean drive are designed and based on different robust electric components, redundant to each other.
- ▲ More than quadruple redundancy prevents system breakdown or stop in a twin propulsion line.
- ▲ Less components and bypass switch technology makes STADT Lean Propulsion® a highly robust and reliable solution, securing limited need for maintenance and a long lifetime for 30 years or more.



## NAVAL FLEET GAINS

- ▲ Vessels deployed quickly and consistently
- ▲ Extremely low possibility for undesirable loss of propulsion
- ▲ Low maintenance costs over the vessel's lifetime
- ▲ Safety of the crew and the vessel
- ▲ Increased space for naval electronic warfare-equipment
- ▲ Lower total weight



*Lean Propulsion® leads to*

## **GREEN OPERATION**

Tightening Environmental requirements put pressure on navies to look for greener solutions to mitigate climate change, reduce air pollution, minimize ecological footprints, and help preserve biodiversity by minimizing underwater noise (URN).

Green operations in the naval fleet are essential for environmental sustainability, economic efficiency, and operational effectiveness. By leveraging STADT Lean propulsion®, navies can achieve these goals, leading to a more sustainable and responsible maritime future.



### **STADT LEAN DRIVES ENSURE**

- ^ Lower power consumption
- ^ Use of renewable green energy sources and alternative fuels
- ^ Easy upgrades and integration of new technologies
- ^ A modular and flexible design

### **NAVAL FLEET GAINS**

- ^ **Green operation profile, major fuel and emission reduction**
- ^ **Longer endurance of the ship without refueling**
- ^ **Reduced operational costs through less energy consumption**
- ^ **Independence on fossil fuels**
- ^ **Ability to combine different energy sources**
- ^ **Meeting environmental regulations, also for low URN**
- ^ **Sustainability and silence by all means**
- ^ **Future oriented propulsion system**

Lean Propulsion® leads to

## DIFFERENCE IN CABLING

Screened cables are obligatory to be used for installations of PWM-based electric propulsion solution onboard any commercial or naval vessel. However, unscreened cables can effectively be used for STADT Lean propulsion® systems.



## STADT LEAN DRIVES - PROVEN CABLING BENEFITS

- ▲ STADT Lean Drive has been **DNV-approved** to be able to use unscreened power cables in the STEALTH noise-free drives.
- ▲ Unscreened cables were also successfully tested in STADT Test Laboratory coordinated by STADT and Norwegian Defence Material Agency.

## NAVAL FLEET GAINS

- ▲ **Significantly reduced costs** associated with installation of propulsion system
- ▲ Unscreened cables are **lighter, easier to handle and install**
- ▲ Unscreened cables can be **more flexible**, making them easier to route in tight spaces
- ▲ Contribution to a **reduction** in overall **weight** onboard, especially if aluminium versions are used
- ▲ New types of class approved aluminium cables can be delivered from STADT in cooperation with Amokabel Norway AS.



*Sinusoidal power leads to*

## PROVEN TECHNOLOGY

The STADT Stealth Drive is a cutting edge technology for the new trend in Naval and Commercial ship propulsion. With the 40 years of expertise and achievements in innovations - STADT is proud to have successful references of STADT Lean Propulsion<sup>®</sup> from over 150 ships and rigs all over the World.

**The STADT Stealth Lean Drives** are verified and approved by DNV, Norwegian Navy, Swedish Navy, and Polish Navy. All parties confirmed the completely Stealth operation.



**PATENTED  
TECHNOLOGY**

## STADT Lean Propulsion<sup>®</sup> - AWARDED TECHNOLOGY



**Received RINA Maritime Innovation Award in London**

RINA (The Royal Institute of Naval Architects) Maritime Innovation Award is a recognition by RINA for contribution and acknowledgement of outstanding scientific and technology research and development in maritime technology areas like propulsion and hydrodynamics.





**Stealth Electric propulsion**  
For any NAVAL & Research ship

**STADT NAVAL AS**

Moljevegen 50 | N-6083 Gjerdsvika | Norway  
Tel.: +47 700 25 800 | [navalsales@stadt.no](mailto:navalsales@stadt.no) | [www.stadt.no](http://www.stadt.no)