SIMPLY THE BEST SOLUTION
FOR ANY FISHING VESSEL
Ship owners need reliable vessels that are efficient to operate, year after year, in all seasons and weather conditions. Most importantly, the ship must have a reliable propulsion system with propellers and power systems that never fail. One that enables them to operate safely anywhere on the planet. As a vendor of conventional PWM propulsion systems for many years, we asked the question: “Can a new way of thinking also give us a new generation of naval propulsion systems that are prepared for tomorrow’s environmental challenges”?

STADT has taken these challenges seriously, when developing the STADT Lean Propulsion®, based on a completely different architecture – a truly revolutionary design.

A lean propulsion system that is amazingly reliable, and also reduces service costs, weight, fuel, emission and waste, while freeing up space.

A sophisticated and silent system with STEALTH performance, extremely long lifetime, and excellent manoeuvrability.

The new drive technology has been awarded several times for its unique characteristics, and many ships are now sailing with the Lean Drive technology all over the world.

Hallvard Slettevoll
Director, CEO
BE PREPARED FOR THE CARBON-NEUTRAL FUTURE

No electromagnetic interference, EMI, due to sine wave operation
No acoustic switching noises
No harmonic voltage distortion, THD, on the ship
No transformers for the propulsion are needed
No electric losses in the drives at normal operation
High redundancy in all levels of the drive systems
Major reduction of space and weight for the drives
Minimal need for cooling of drives and its systems
No need for screened power cables and cable segregation
Rugged and very well proven technologies
MTBF and lifetime improved dramatically compared to competitors
Simplified technology, 80% reduction in number of components

COMPLETE SILENCE
BIGGER CATCH
HIGHER COMFORT
BETTER CREW WELFARE
STADT LEAN PROPULSION® - PATENTED TECHNOLOGY

Superior technology with Stealth performance. Ensures that the propeller never stops.

SUSTAINABLE, LEAN AND GREEN:

- Reduced fuel consumption, by slow steaming
- Only 6% losses in systems (AC Motors and alternators included.)
- Reduced NOx, SOx, BC and CO2 emission
- Reduced maintenance and high redundancy
- Slow steaming optimized and lower EEDI

LEAN DRIVE FOR ANY SIZE OF SHIPS
EXPERIENCING THE **STADT LEAN PROPULSION®**

*From MS HARTO - Purse Seiner*

We installed the STADT diesel-electric propulsion in 2008 – now more than 10 years ago. It was a pioneer project, and many thought we were crazy - not using a main diesel engine. Over the 10 years of fisheries in the northern Atlantic, we have seen that the STADT-technology has given us a very robust ship that operates very silent by all means. Extremely low noise when we are searching for the fish, operating with only one genset instead of all the 4 that is in place. It gives a better catch, and we have a very high comfort onboard, in particular when we should go to sleep. The unique noise-free STADT technology does not disturb our sensitive fishing sensors.

It has also been a great advantage for us the redundancy built in to the system, from power generation through switchboard and electric propulsion motor drive arrangements. We have so far never been out of service, and STADT has helped us in an excellent way the very few times something needed to be serviced.

*Tor Hugo Bergtun*

*MS HARTO ship owner*
## EVALUATION OF TODAY'S DIFFERENT DRIVE SOLUTIONS

<table>
<thead>
<tr>
<th>Lean Issues To Consider</th>
<th>STADT Lean Drive</th>
<th>12 Pulse or 24 Pulse</th>
<th>AFE (Active Front End)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology in AC drive</td>
<td>Sine Wave</td>
<td>PWM</td>
<td>PWM</td>
</tr>
<tr>
<td>No. of electric energy transformations</td>
<td>0</td>
<td>4</td>
<td>4 or 5</td>
</tr>
<tr>
<td>Power Train Losses</td>
<td>No, (negligible)</td>
<td>6 %</td>
<td>6 - 7 %</td>
</tr>
<tr>
<td>Cooling Type</td>
<td>Air is sufficient</td>
<td>Water</td>
<td>Water</td>
</tr>
<tr>
<td>Power Transformers Needed</td>
<td>No</td>
<td>Yes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Redundant Power Units</td>
<td>Standard</td>
<td>Special</td>
<td>Special</td>
</tr>
<tr>
<td>Harmonic Distortion (THD)</td>
<td>No</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Electromagnetic Interference</td>
<td>No</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Acoustic Switching Noise</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Screened Power Cables needed</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Depending on Harmonic Filters</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Designed Economic Lifetime</td>
<td>30 Years</td>
<td>6 Years</td>
<td>6 Years</td>
</tr>
<tr>
<td>Maintenance Requirement</td>
<td>Very Low</td>
<td>Frequent</td>
<td>Frequent</td>
</tr>
<tr>
<td>Onboard Crew Skills</td>
<td>Ordinary</td>
<td>Special</td>
<td>Special</td>
</tr>
<tr>
<td>MTBF (mean time between failures)</td>
<td>7 Years</td>
<td>1 Year</td>
<td>1 Year</td>
</tr>
<tr>
<td>MTTR (mean time to repair)</td>
<td>1 Hour</td>
<td>1 Week</td>
<td>1 Week</td>
</tr>
<tr>
<td>Spares Globally Available</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Weight of Drive System</td>
<td>100 %</td>
<td>1100 % - 1400 %</td>
<td>600 % - 1600 %</td>
</tr>
<tr>
<td>Size of Drive System</td>
<td>100 %</td>
<td>500 % - 600 %</td>
<td>450 % - 700 %</td>
</tr>
<tr>
<td>All Voltage Class (220V-15kV)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Power Scalable</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Regenerates Power to Grid</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No. of Power Components in Line</td>
<td>1</td>
<td>80 000</td>
<td>150 000</td>
</tr>
<tr>
<td>Capacitors In Main Power Circuit</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Explosion Risk in Drive</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Propeller Pitch Configuration</td>
<td>CP</td>
<td>CP or FP</td>
<td>CP or FP</td>
</tr>
<tr>
<td>Financial Risk (Service cost, Off-hire)</td>
<td>Very Low</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
TECHNOLOGY DIFFERENCES

STADT LEAN PROPULSION® TECHNOLOGY

PWM TECHNOLOGY DIFFERENCES

PWM CREATES A LOT OF EMI AND ACOUSTIC SWITCHING NOISE

SINE WAVE IS NOISE FREE, NO EMI

STEALTH
THE DIFFERENCE:

See our animated film at www.STADT.no
DISCOVER THE POWER OF SIMPLICITY

ELIMINATED:
- POWER DISTURBANCE THD ON GRID
- HARMONIC FILTERS
- 12 P - 24 P TRANSFORMER
- NOISE (PWM>EMC)
- EXPLOSION RISK (CAPACITORS)
- 80,000 COMPONENTS
- COOLING SYSTEMS
- 5-6 % WASTED HEAT
- COMPLEXITY

= LESS OFF-HIRE

MORE:
+ REDUNDANCY IN DRIVE
+ STEALTH
+ HMS AND COMFORT (SILENCE)
+ REDUNDANCY, ALSO IN AC PROPULSION MOTORS
+ POWER TO PROPELLER

= BETTER PERFORMANCE
COMPLEX PWM DRIVES (for comparison)

AFE PWM 12 OR 24 PULSE PWM

Can never be STEALTH or Noise-Free
STADT LEAN PROPULSION® REFERENCES

Seihav
WELL-BOAT
Diesel-electric Propulsion
Thrusters Drive System

Voldnes
Purse Seiner
Diesel-electric Propulsion
Thrusters Drive System

Meløyfjord
Purse Seiner
Diesel-electric Propulsion
Thrusters Drive System

Harto
Purse Seiner
Diesel-electric Propulsion
Thrusters Drive System

Hepsøhav
Purse Seiner
Thrusters Drive System

Sjøglans
Purse Seiner
Thrusters Drive System
See www.STADT.no for more references
WHY WE USE CPP - CONTROLLABLE PITCH PROPELLER

THE PATENTED STADT LEAN DRIVE COMBINES PITCH AND RPM-CONTROL

- Significantly improved overall efficiency at varying load and/or varying speed conditions
- Better manoeuvrability (acceleration, breaking, crash stop)
- Better performance at reversing and in DP
- Better operational conditions for gear, shaft, and bearings, especially at low speed
- Forgiving for design errors
- Each blade may be changed independently if damaged, at sea
- Future-proof with regard to changes of use of the vessel, slow steaming, extensions, etc.
- Possibility for full feathering position, which is saving fuel when only running one propeller
STADT HYBRID

Carbon-Robust Solutions:

Wind - Solar - Battery
LNG - BioGas - BioFuel - MDO

HVO
Hydrogen
Ammonia
Methanol and E-fuels
STADT LEAN PROPULSION® ARRANGEMENTS - IEP

SOME BASIC ARRANGEMENTS FOR FULL ELECTRIC PROPULSION, BASED ON DIESEL, LNG OR BIO FUELS

Single screw PTI, CP
- 4 generators
- 2 electric motors, big and smaller
- 2 main switchboards

Single screw Twin, CP
- 4 generators
- 2 electric motors
- 2 main switchboards

Twin screw PTI, CP
- 4 generators
- 4 electric motors, big and smaller
- 2 main switchboards

Twin screw, CP
- 4 generators
- 2 electric motors
- 2 main switchboards
STADT - YOUR SYSTEM INTEGRATOR

LET US DESIGN YOUR NEW SUSTAINABLE PROPULSION SOLUTION
THE STADT SCOPE

Delivered to meet any typical ship classification standard.

STADT Lean Drives. Scalable in power to more than 50 MW per propeller.

STADT AC motors, a broad range.

STADT main switchboards, MCC, low voltage and medium voltage.

STADT power generators, battery systems, shore-to-ship power solutions, distribution transformers, etc.

Power Management System (PMS), IAS, remote access from shore, Dynamic Positioning (DP).

SERVICES and EPC:
- Engineering of propulsion solutions
- Manufacturing and installation
- Commissioning
- Global Services
The STADT Group was founded by Hallvard L. Slettevoll in 1985. We are located in the new and modern STADT Maritime Center in Gjerdsvika harbour.

For many years STADT has been a leading company in AC drive innovations. Long experience from development of motor drives has resulted in the patented STADT Lean Drive technology. This has huge advantages compared to traditional PWM-technology, since it is free from electric disturbances. The STADT Lean Drive is also a very efficient power drive system, bringing reliability up to a new standard.

The first STADT electric propulsion delivery went to the Norwegian coastguard K/V Tromsø in 1996, representing a technological breakthrough.

The Lean Drive was patented in 2008, and launched to the first ship applications the same year. The new drive technology has been awarded several times for its unique characteristics, and many ships are now sailing with the Lean Propulsion® technology all over the world.
LEAN BRINGS YOU

+ SAFETY & RELIABILITY
+ VERY LONG LIFETIME
+ STEALTH & HSE
+ MORE CARGO CAPACITY
+ LESS EMISSION AND FUEL
+ COST EFFICIENCY