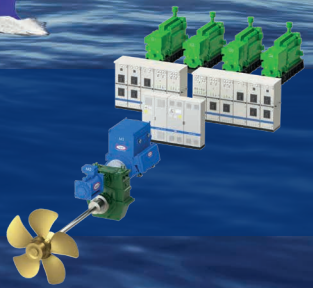
STADT®

LEAN PROPULSION

SIMPLY THE BEST SOLUTION
FOR ANY FISHING VESSEL



STADT LEAN PROPULSION

Ship owners needs 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 DRIVE, 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 DRIVE**

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 Ketil Bergtun

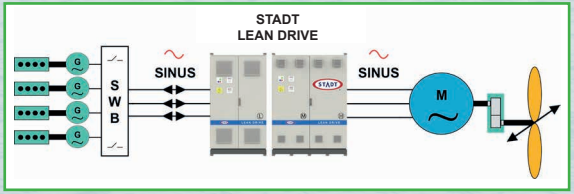
MS HARTO ship owner

EVALUATION OF TODAYS DIFFERENT DRIVE SOLUTIONS

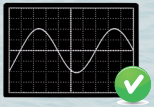
Lean Issues To Consider	STADT Lean Drive	12 Pulse or 24 Pulse	AFE (Active Front End)
Technology in AC drive	Sine Wave	PWM	PWM
No. of electric energy transformations	0	4	4 or 5
Power Train Losses	No, (negligible)	6 %	6 - 7 %
Cooling Type	Air is sufficient	Water	Water
Power Transformers Needed	No	Yes	Sometimes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

TECHNOLOGY DIFFERENCES

STADT LEAN DRIVE TECHNOLOGY

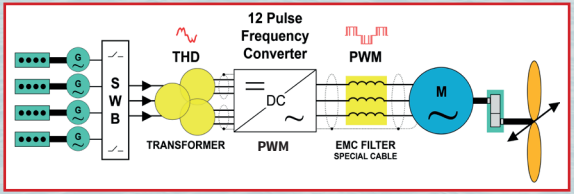


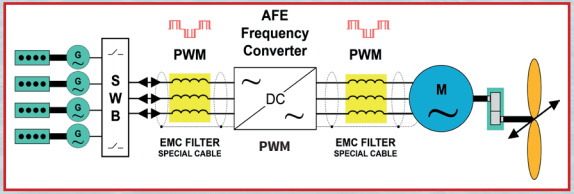
STEALTH

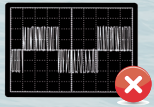


SINE WAVE IS NOISE FREE,
NO EMI

COMPETITOR PWM DRIVE TECHNOLOGY

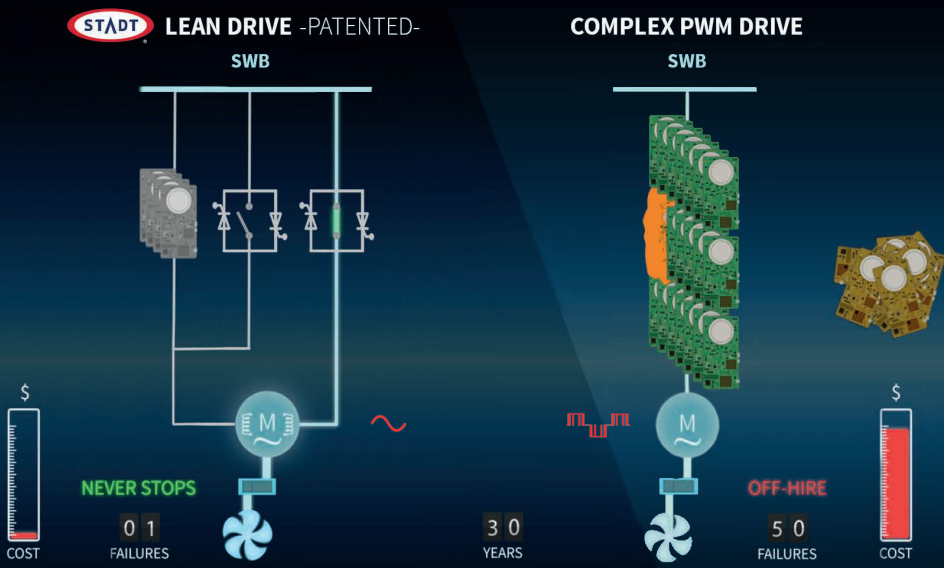






PWM CREATES A LOT
OF EMI AND ACOUSTIC
SWITCHING NOISE

THE DIFFERENCE:



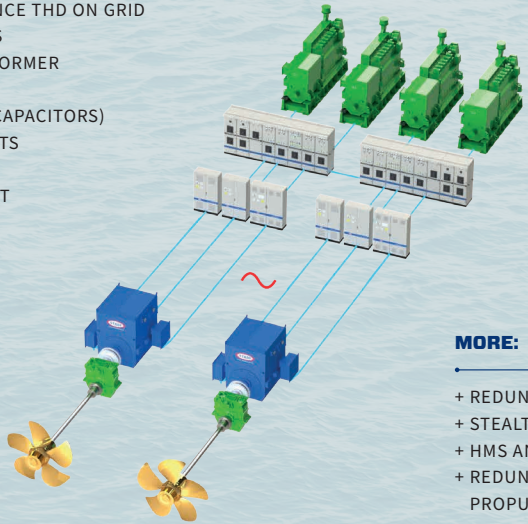
See our animated film at www.STADT.no

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



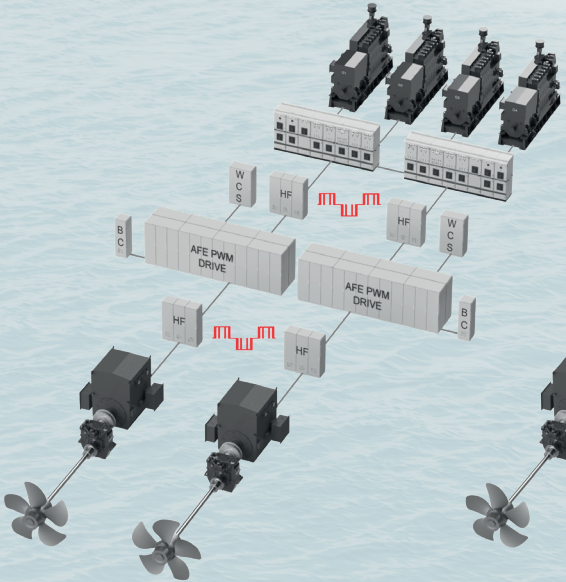
STADT LEAN DRIVE

MORE:

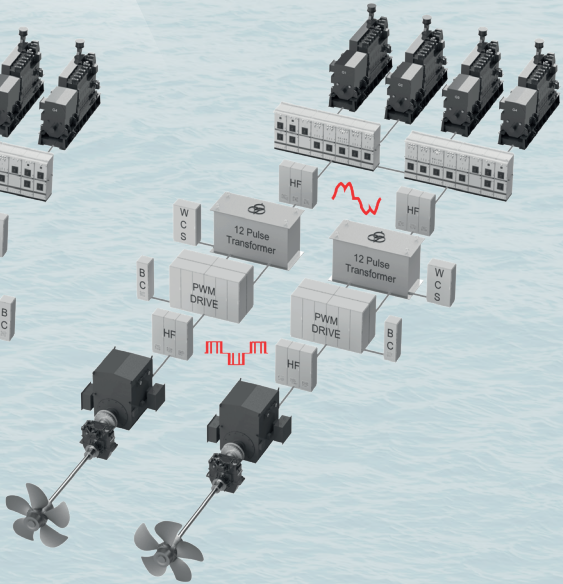
+ REDUNDANCY IN DRIVE
+ STEALTH
+ HMS AND COMFORT (SILENCE)
+ REDUNDANCY, ALSO IN AC PROPULSION MOTORS
+ POWER TO PROPELLER

= BETTER PERFORMANCE

COMPLEX PWM DRIVES



AFE PWM



12 OR 24 PULSE PWM

STADT PROPULSION REFERENCES

MS “Seihav”
WELL-BOAT
Diesel-electric Propulsion
Thrusters Drive System

MS “Meløyfjord”
Purse Seiner
Diesel-electric Propulsion
Thrusters Drive System

MS “Voldnes”
Purse Seiner
Diesel-electric Propulsion
Thrusters Drive System

MS “Harto”
Purse Seiner
Diesel-electric Propulsion
Thrusters Drive System

MS “Hepsøhav”
Purse Seiner
Thrusters Drive System

MS “Sjøglans”
Purse Seiner
Thrusters Drive System

MS “Hovden Viking”
Purse Seiner
Thrusters Drive System

MS “Slettholmen”
Purse Seiner
Thrusters Drive System

MS “Solværskjær”
Purse Seiner
Thrusters Drive System

MS “Sildaskjær”
Purse Seiner
Thrusters Drive System

MS “Bernt Oskar”
Purse Seiner
Thrusters Drive System

See www.STADT.no
for more references

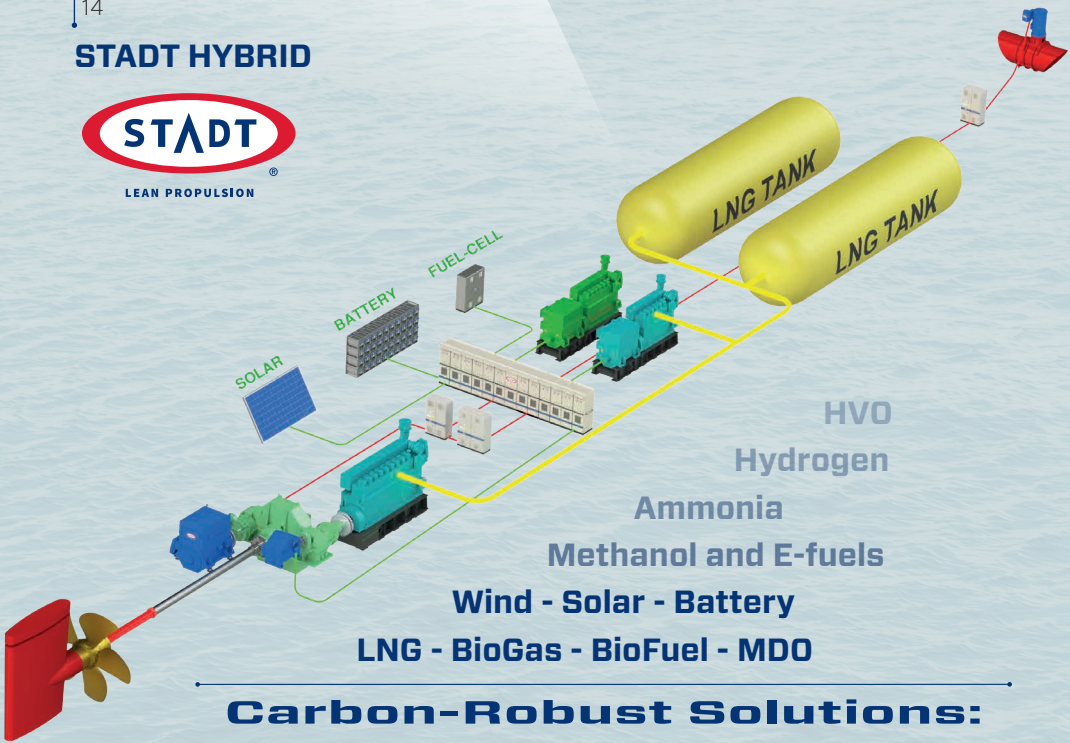
WHY WE USE CPP - CONTROLLABLE PITCH PROPELLER

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

STADT
LEAN PROPULSION

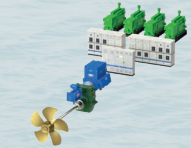


HVO
Hydrogen
Ammonia
Methanol and E-fuels
Wind - Solar - Battery
LNG - BioGas - BioFuel - MDO

Carbon-Robust Solutions:

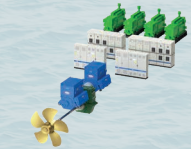
STADT LEAN PROPULSION ARRANGEMENTS

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



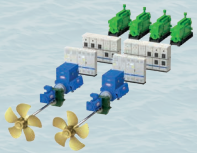
Single screw PTI, CP

- 4 generators
- 2 electric motors, big and smaller
- 2 main switchboards



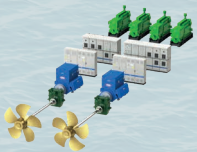
Single screw Twin, CP

- 4 generators
- 2 electric motors
- 2 main switchboards



Twin screw PTI, CP

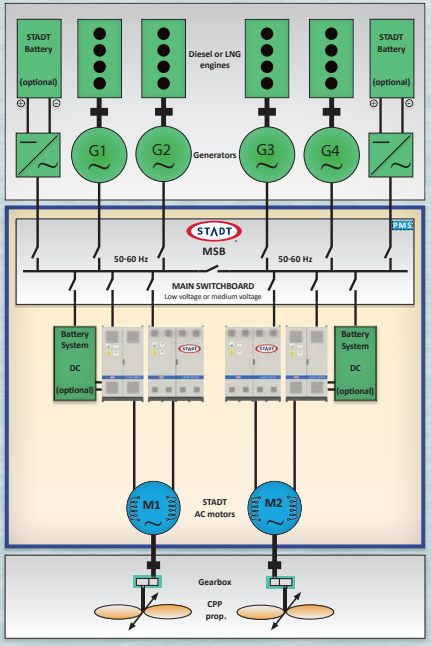
- 4 generators
- 4 electric motors, big and smaller
- 2 main switchboards



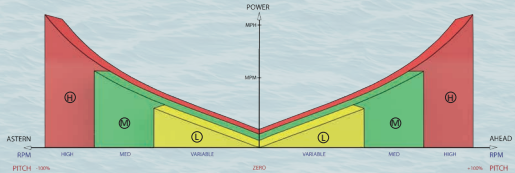
Twin screw, CP

- 4 generators
- 2 electric motors
- 2 main switchboards

STADT - YOUR SYSTEM INTEGRATOR



LET US DESIGN YOUR NEW SUSTAINABLE PROPULSION SOLUTION



THE STADT SCOPE

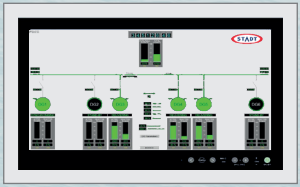
Delivered to meet any typical ship classification standard and MIL-STD-901

STADT Lean Drives. Scalable in power up to 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

STADT - AWARDED TECHNOLOGY LEADER

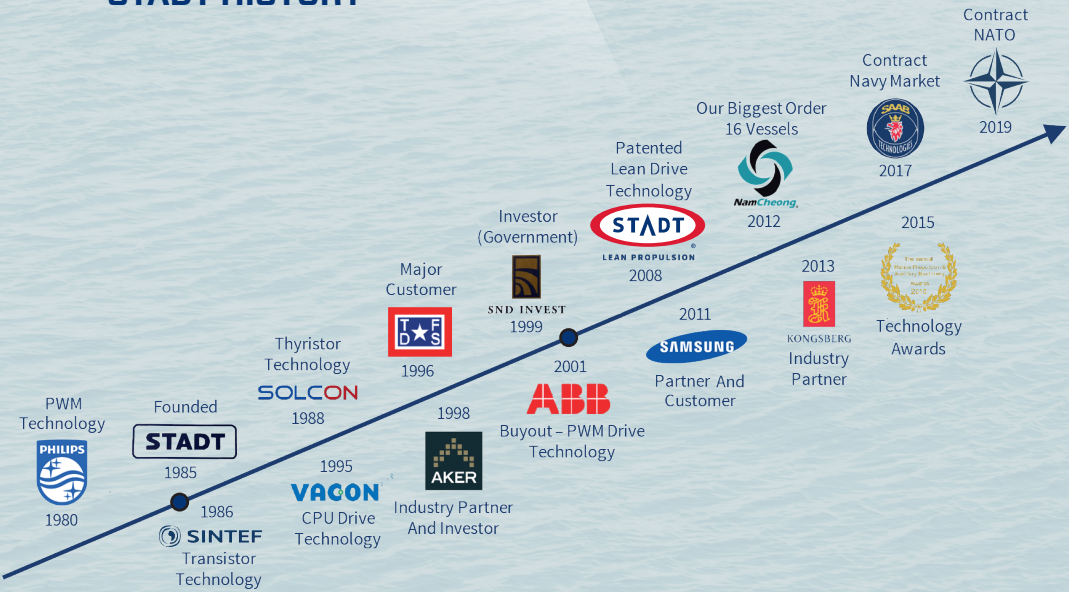
The STADT Group was founded by Hallvard L. Slettevoll in 1985. We are located in the new and modern STADT Maritime Center in Gjerdsvika harbour.

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 Drive technology all over the world.

STADT HISTORY



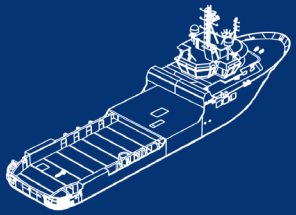
30 YEARS IN AC DRIVE DEVELOPEMENT

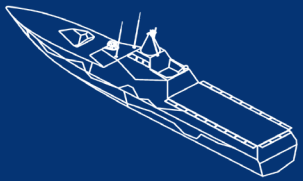
LEAN BRINGS YOU

+ SAFETY & RELIABILITY
+ VERY LONG LIFETIME

+ STEALTH & HSE
+ MORE CARGO CAPACITY

+ LESS EMISSION AND FUEL
+ COST EFFICIENCY





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LEAN PROPULSION

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