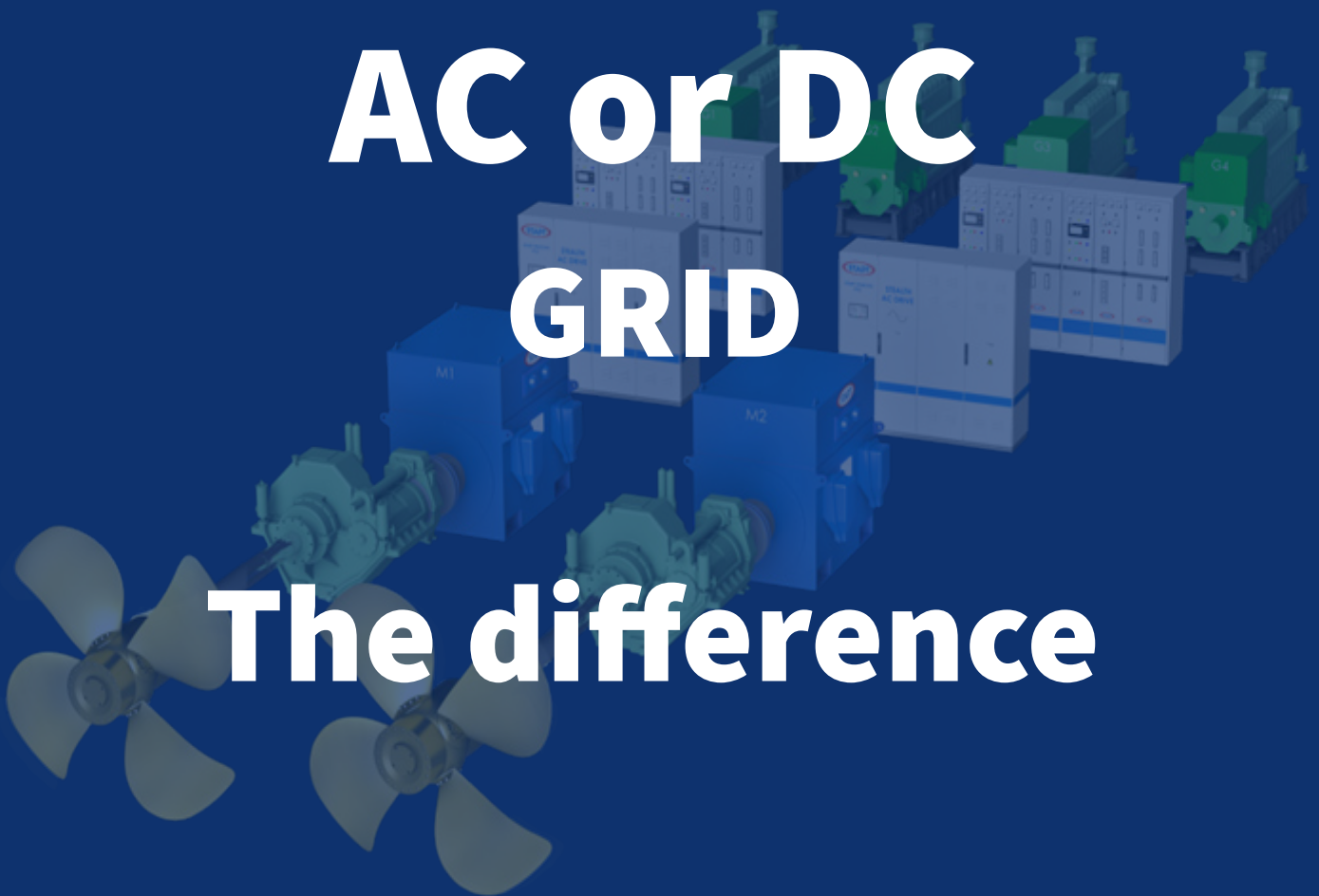




LEAN PROPULSION

AC or DC GRID

The difference

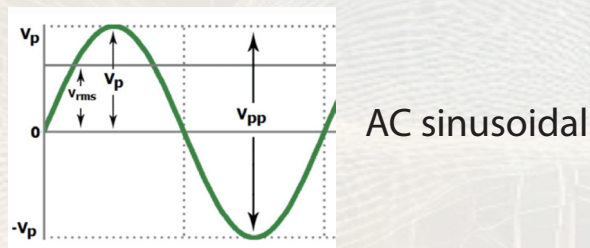


These days - several tech companies strongly advocate for the introduction of DC energy grids, even in diesel-electric propulsion solutions.

One of their key arguments is the potential to save fuel by controlling the speed of diesel generators, particularly under low-load conditions.

However, DC grids are an old technology that was abandoned before being fully developed in favor of the much more efficient AC technology.

AC offers numerous well-known advantages, including a wide range of proven components, available worldwide.

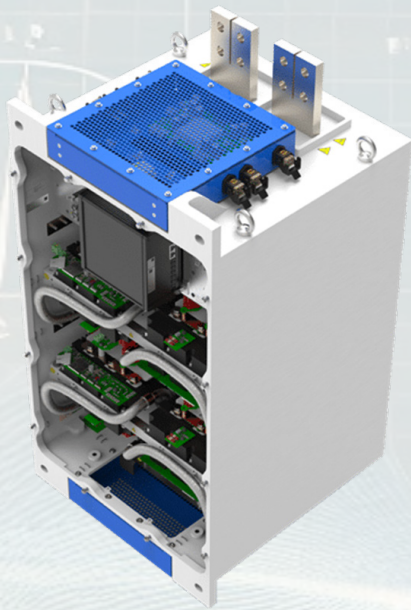


At STADT, we have evaluated AC versus DC grids from our Lean Propulsion[®] perspective.

Our conclusion led to the STADT VARIGRID[™] solution, which achieves additional fuel savings by combining the fuel-efficient STADT Lean Drive with variations in AC-grid frequency.

This enables variable speed for the diesel generators, accomplished through simple, efficient, and proven AC technology that is scalable and available for any configuration and power requirement.

In contrast to the dominant AC grids used on most ships, DC grids require stepping 50 years back in time by reintroducing melting fuses as the overload protection device in their main power distribution switchboards. This antiquated approach is observed in a new ship currently under delivery from one of the well-known suppliers.



DC type breaker

3200 Ampere

Solid state IGBT breaker

Power losses at full load:

20 kW !

WATER COOLED due to the very high power losses !

NOT withdrawable,
Bolted fixed.

Does not isolate the grids but needs extra ACB for actual isolating, in series.

Only for low voltage & power



AC type breaker

3200 Ampere

ACB - Air Circuit Breaker

Power losses at full load:

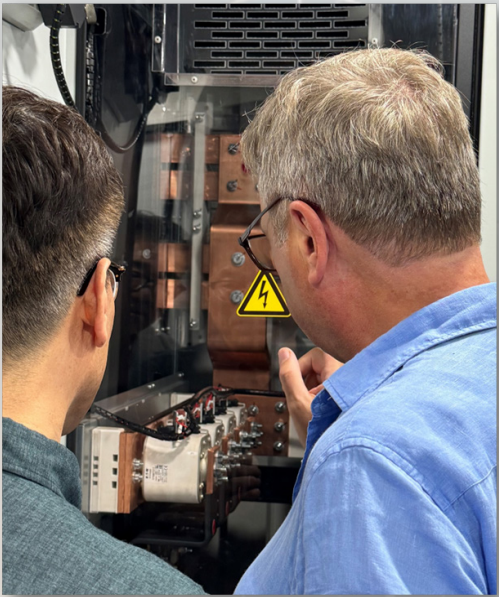
0,6 kW

AIR COOLED

FULLY withdrawable
Replaceable by crew.
Isolates grids!

For low and medium voltage & power

There is a clear marked understanding that for high power & voltage solutions , - only AC is relevant.



DC power distribution "breaker"

FUSES (bolted)
- a non-resetable
bolted melting Fuse !

NOT RESETABLE, nor Replaceable – BUT BOLTED !

Needs to make the whole system powerless until trained crew can mechanically dismantle and replace those fuses.

This kind of fuse protection technology was left 50 Years ago in the AC world of technology.

— A Cheap Solution - in the first place —

DC generators & DC motors are not a viable choice in 2025, due to cost, severe maintenance and failure issues.



AC power distribution breaker and protection

MCCB (Molded Case Circuit Breaker) & ACBs

- RESETTABLE
- REPLACABLE
- ADJUSTABLE
- AVAILABLE
- SAFE USE, FULLY ISOLATED

Their resettable and replaceable design ensures minimal downtime during maintenance or faults.

The adjustable trip settings offer flexibility, making MCCBs a obvious choice for ship power distribution.

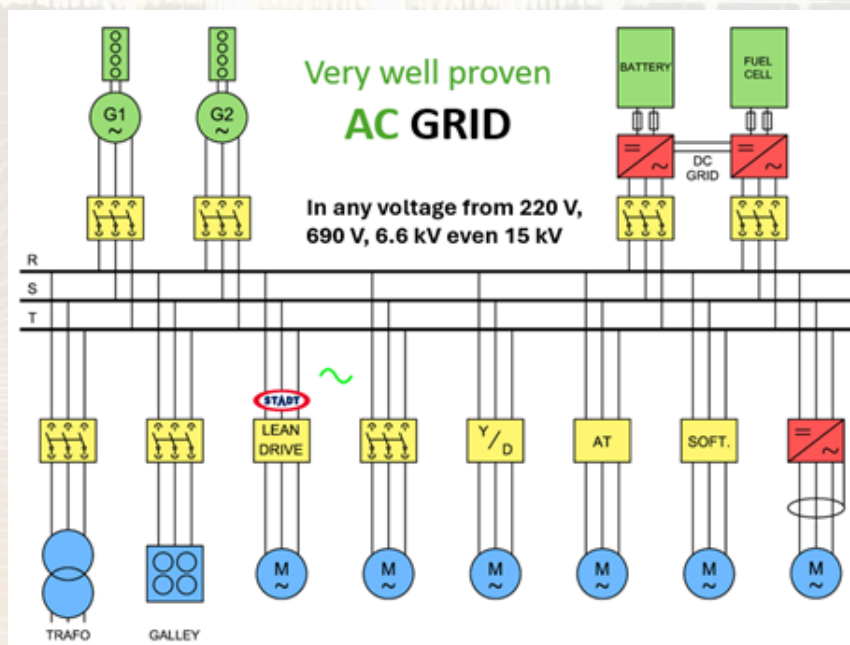
AC generators & AC motors are completely dominating in the energy sector, - due to their extreme reliability.

AC Grid Architecture

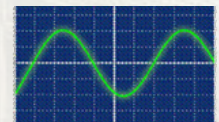
AC-grid systems utilizing STADT Lean Propulsion® are centered around an AC main switchboard, where AC current serves as the primary power source for distributing electric power to propulsion systems and other major consumers.

This approach eliminates unnecessary power conversions, enhancing efficiency and reliability.

No melting fuses
- only MCCB and ACBs



Very limited need for inverters



AC = sinus undisturbed

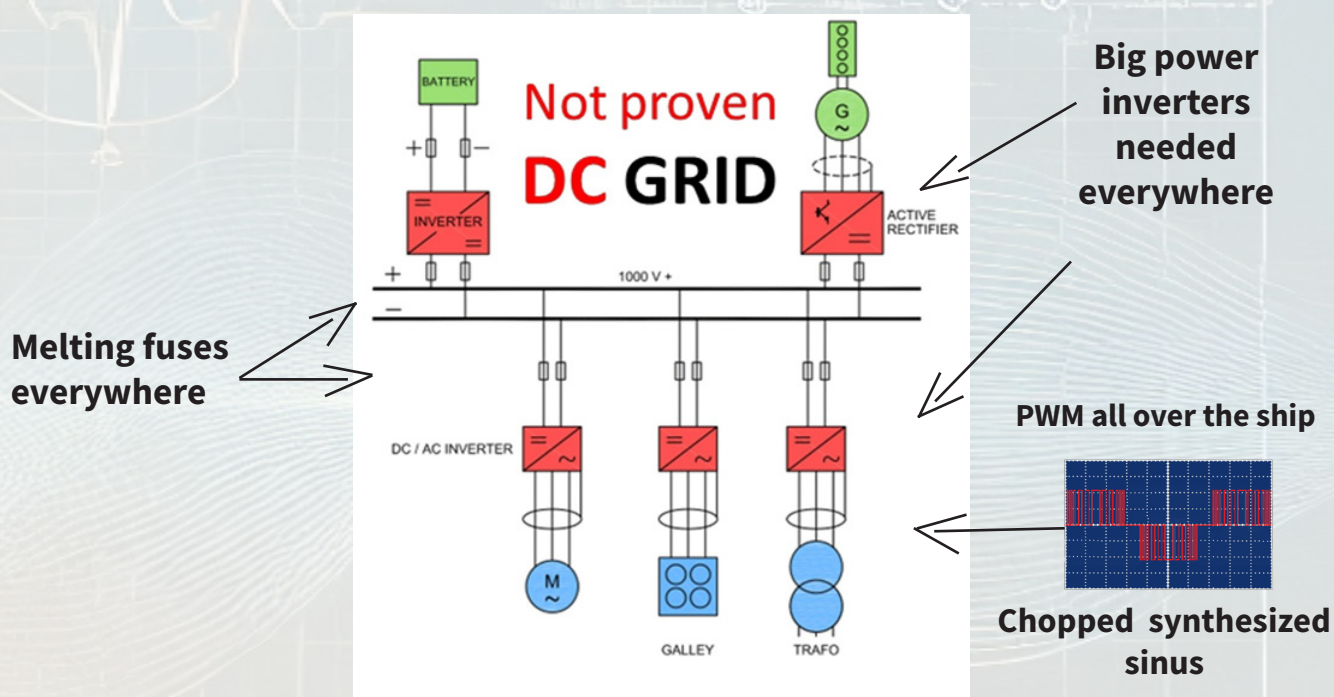
The AC grid, particularly when combined with STADT Lean Propulsion®, is designed to be free from EMI (EMC), and Total Harmonic Distortion (THD).

This ensures compliance above strict EMC standards, minimizing the risk of interference with other onboard systems and enhancing overall operational reliability. Underwater Radiated Noise (URN) is also brought to a minimum.

Smaller DC sub-grids can easily be added - if required.

DC Grid Architecture

- Can never be a low-noise solution, neither from an EMI nor other perspectives.
- Will introduce substantial power conversion losses throughout the ship's lifetime.
- Increases complexity to the point where the shipowner will be completely depending to the supplier of the DC grid for the vessel's lifetime. This leads to high OPEX.



This design leads to longer downtime and increased maintenance complexity compared to more flexible AC circuit protection solutions.

Does this provide any real benefit to a shipowner?

How can classification societies and shipowners approve DC power distribution - such an outdated and sensitive solution?

THE CURRENT WAR

THE TALE OF AN EARLY TECH RIVALRY

DC

DIRECT CURRENT


The flow of electricity is in one direction only. The system operates at the same voltage level throughout and is not as efficient for high-voltage long distance transmission.

Direct current runs through:

- Battery-Powered Devices
- Fuel and Solar Cells
- Light Emitting Diodes

"(TESLA'S) IDEAS ARE SPLENDID, BUT THEY ARE UTTERLY IMPRACTICAL."

- THOMAS EDISON



THOMAS EDISON VS. **NIKOLA TESLA**

You would have never found two geniuses so spiteful of each other beyond turn-of-the-century inventors Nikola Tesla and Thomas Edison. They worked together—and hated each other. Let's compare their life, achievements, and embittered battles.

AC

ALTERNATING CURRENT

Electric charge periodically reverses direction and is transmitted to customers by a transformer that could handle much higher voltages.

Alternating current runs through:

- Car Motors
- Radio Signals
- Appliances

"IF EDISON HAD A NEEDLE TO FIND IN A HAYSTACK, HE WOULD PROCEED AT ONCE... UNTIL HE FOUND THE OBJECT OF HIS SEARCH. I WAS A SORRY WITNESS OF SUCH DOINGS, KNOWING THAT A LITTLE THEORY AND CALCULATION WOULD HAVE SAVED HIM 90 PERCENT OF HIS LABOR."

- NIKOLA TESLA

1847 BORN 1858

Milan, Ohio BIRTHPLACE Smiljan, Croatia

Wizard of Menlo Park NICKNAME Wizard of the West

Home-schooled and self-taught EDUCATION Studied math, physics, and mechanics at The Polytechnic Institute at Graz

Mass communication and business FORTÉ Electromagnetism and electromechanical engineering

Trial and error METHOD Getting inspired and seeing the invention in his mind in detail before fully constructing it

DC (Direct Current) WAR OF CURRENTS: ELECTRICAL TRANSMISSION IDEA AC (Alternating Current)

Incandescent light bulb; phonograph; cement making technology; motion picture camera; DC motors and electric power

NOTABLE INVENTIONS Tesla coil - resonant transformer circuit; radio transmitter; fluorescent light; AC motors and electric power generation system

1,093 NUMBER OF US PATENTS 112

0 NUMBER OF NOBEL PRIZES WON 0

1 NUMBER OF ELEPHANTS ELECTROCUTED 0

1931—Passed away peacefully in his New Jersey home, surrounded by friends and family DEATH 1943—Died lonely and in debt in Room 3327 at the New Yorker Hotel

FALLING OUT

Edison promised Tesla a generous reward if he could smooth out his direct current system. The young engineer took on the assignment and ended up saving Edison more than \$100,000 (millions of dollars by today's standards). When Tesla asked for his rightful compensation, Edison declined to pay him. Tesla resigned shortly after, and the elder inventor spent the rest of his life campaigning to discredit his counterpart.

"Genius is one percent inspiration and ninety nine percent perspiration." - Thomas Edison

LATE BLOOMER

Thomas Edison, the youngest in his family, didn't learn to talk until he was almost 4 years old.

WAR OF CURRENTS OFFICIALLY SETTLED

In 2007, Con Edison ended 125 years of direct current electricity service that began when Thomas Edison opened his power station in 1882. It changed to only provide alternating current.

EDISON FRIES AN ELEPHANT

In order to prove the dangers of Tesla's alternating current, Thomas Edison staged a highly publicized electrocution of the three-ton elephant known as "Topsy." She died instantly after being shocked with a 6,600-volt AC charge.

NOBEL PRIZE CONTROVERSY

In 1915, both Edison and Tesla were to receive Nobel Prizes for their strides in physics, but ultimately, neither won. It is rumored to have been caused by their animosity towards each other and refusal to share the coveted award.

SOURCES: CHENEY, MARGARET. "TESLA: MAN OUT OF TIME" | UTH, ROBERT. "TESLA: MASTER OF LIGHTNING." | THOMASEDISON.COM | PBS.ORG | WEB.MIT.EDU | NIRED.COM

A COLLABORATION BETWEEN GOOD AND COLUMN FIVE

————— Your choice —————



LEAN PROPULSION

www.stadt.no