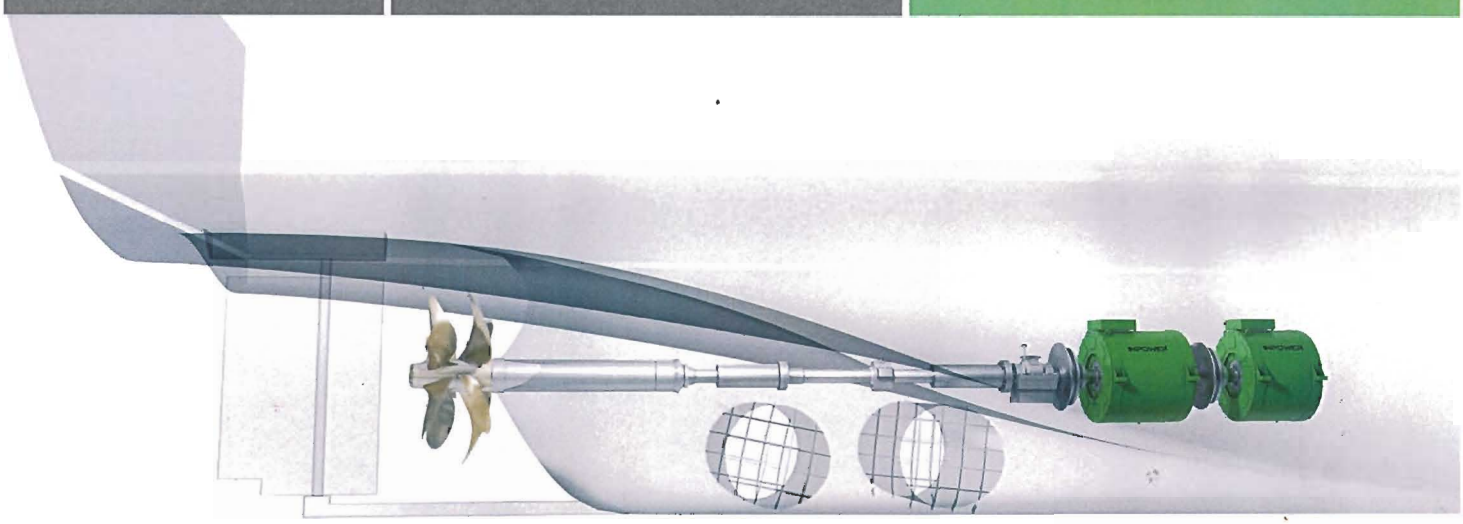
Scana
PROPULSION

CREATING PROGRESS

Contra Rotating Propulsion

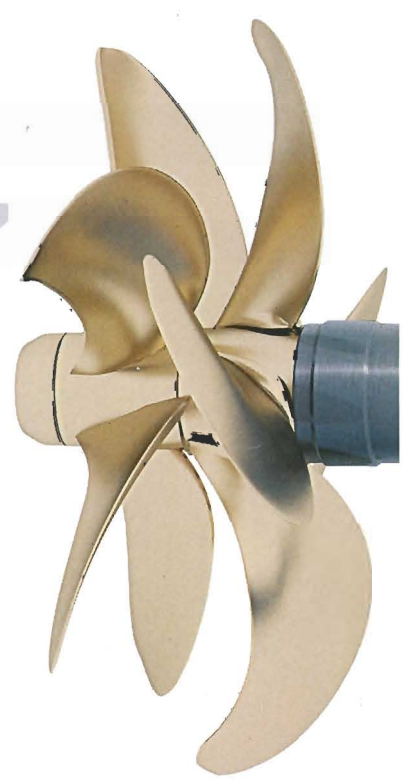
A complete system with significant efficiency improvements

SAVES FUEL | **LESS COMPONENTS** | **22% MORE EFFICIENT***



*More efficient than an azimuth system – see calculations on Page 2

"A UNIQUE COMBINATION OF KNOWN TECHNOLOGIES"



OVERVIEW

Contra Rotating Propulsion by Scana asserts great advancements in both efficiency and robustness, including lower fuel consumption and highly efficient permanent magnet propulsion. This is a complete system which features environmentally friendly propulsion through low emissions.

Savings with an entire system

Primary benefits of the Contra Rotating Propulsion system

For the last 15 - 20 years, the majority of Offshore Support Vessels have been propelled by various types of azimuth propulsion systems. There is a common understanding in the market that when used in primary propulsion, azimuth thrusters have advantages in DP and maneuverability conditions, but are less effective in transit conditions. Recent history shows azimuth propulsion represents higher maintenance both in cost and time when compared to CP or FP propeller systems, and thereby also higher down time.

The Scana Propulsion Contra Rotating Propulsion system has been model tested with the Salt 100 – design from Salt Ship Design, which shows considerable savings compared to an azimuth propulsion system.

Simulated figures based on:

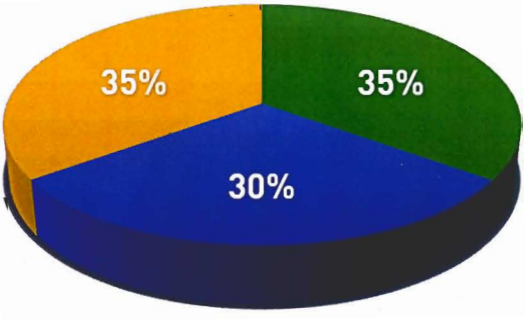
12 knots, 5.5m draught, 1.5m fwd trim (approx. 3000t deadweight)
Scana CRP: Propeller Data - Model test with CRP - 3.8m Ø forward propeller and 3.4m Ø aft propeller. El. motor load factor (PB/el. motor power) 0.34
Azimuth System: CRP Azimuth. El. motor load factor (PB/el. motor power) 0.33
Fuel calculations are based on specific fuel consumption of 185g/kWh. 250kW hotel and auxiliary load included.

SYSTEM EFFICIENCY BETTER EFFICIENCY THAN AZIMUTH SYSTEMS

	Azimuth	CRP	
Propeller Efficiency	61%	71%	↑
Propulsive Efficiency	61%	70%	↑
Mechanical Efficiency	91%	96%	↑
Electric Motor Efficiency	91%	96%	↑
Total Efficiency	**50%**	64%	↑
Max. Speed @ 4MW Pb (kN)	14.8 (-0.5)	15.3	↑
Fuel Consumption (t/d)	9.5 (+22%)	7.8	↓

THE CRP SYSTEM SAVES UP TO 22% IN FUEL EACH DAY

FUEL EFFICIENCY SAVE OVER 2 MILLION DOLLAR IN FUEL EACH YEAR



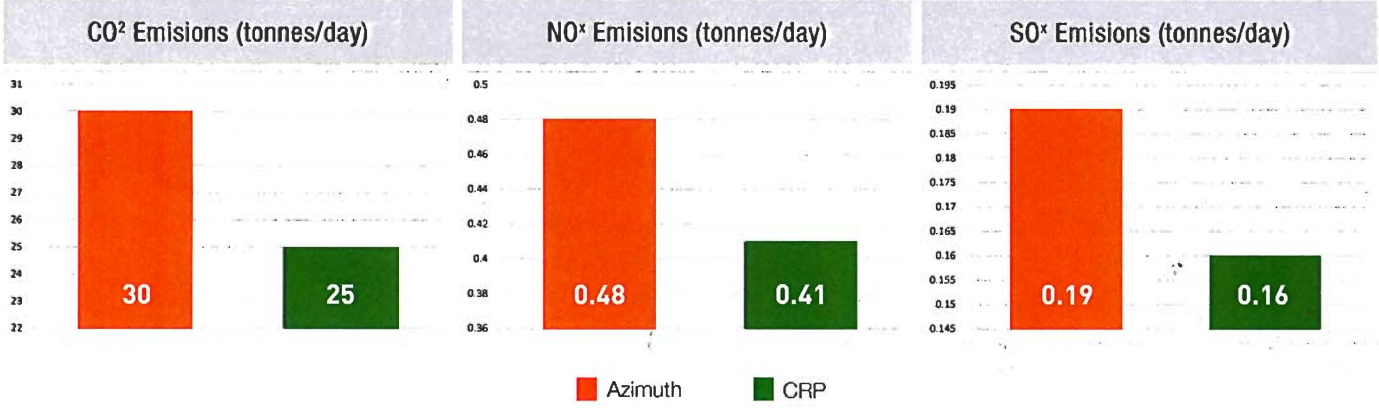
EXAMPLE PROFILE FOR OFFSHORE SUPPORT VESSEL	Azimuth	CRP
Transit	1861	1545
Dynamic Positioning	515	518
Standby / Port	194	194
Total (tonnes fuel/year)	2570	2257
		Δ 313 tonnes

THE CRP SYSTEM SAVES UP TO 313 TONNES OF FUEL EACH YEAR

PROS & CONS THE CRP SOLUTION FEATURES MONEY-SAVING BENEFITS

	Azimuth	CRP
Pros	• Most common solution for PSVs • Good DP capability • Advantages with regards to cargo tank arrangement • Attractive investment cost	• Less components and lower maintenance • Located far from shipside • Center skeg protects shaftlines • Fixed-pitch monoblock propellers
Cons	• System with high insurance claims • Primary reason for high maintenance and off-hire • Directional stability can be an issue	• Slightly less maneuverability in dynamic positioning than azimuths • Higher investment cost

EMISSIONS THE CRP IS THE CLEANEST SOLUTION



DYNAMIC POSITIONING MINIMAL DIFFERENCE IN DP CAPABILITIES

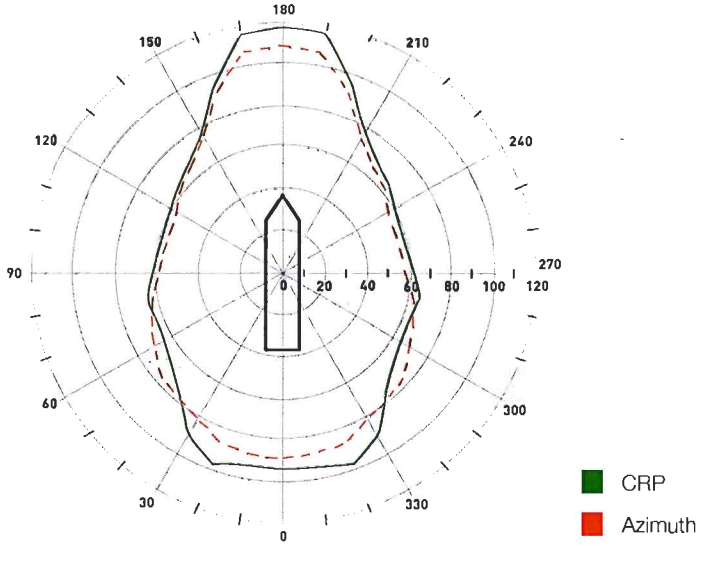
The difference in dynamic positioning capabilities between azimuths and other systems has long been misunderstood. When compared to the Contra Rotating Propulsion system, there is actually minimal difference between each system's capabilities.

- Two aft tunnel thrusters provide DP capability equivalent to azimuth configurations
- DnV approved ERN 99.99.99.99

Conditions for DP Plot:

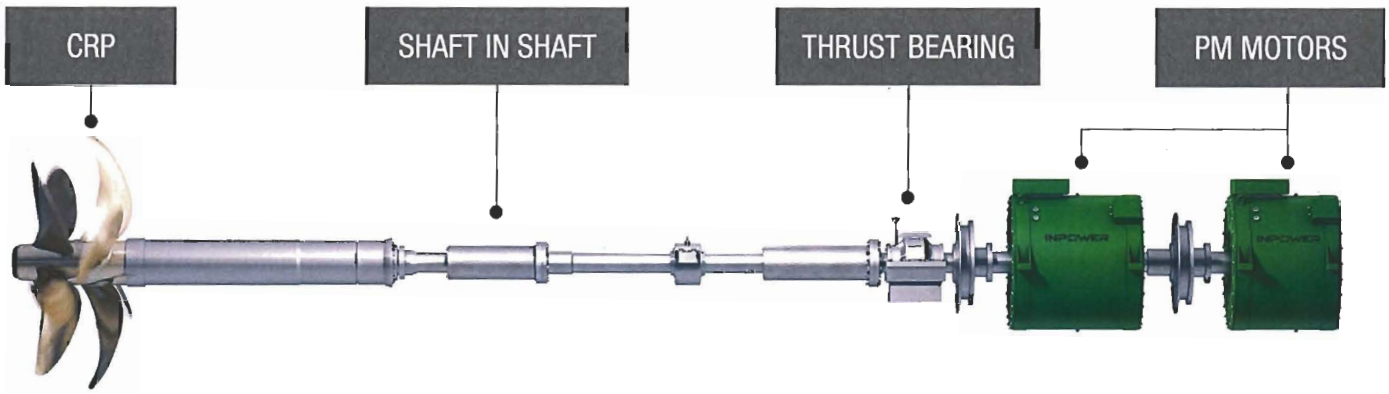
Scana CRP: 1x CRP, 2x tunnel thrusters in aft ship, and 2x tunnel thrusters and 1x retractable azimuth in forward ship.

Azimuth: 2x azimuths in aft ship, and 2x tunnel thrusters and 1x retractable azimuth in forward ship.



Unique Combination of Known Technologies

Primary components of the Contra Rotating Propulsion system



Contra Rotating Propeller

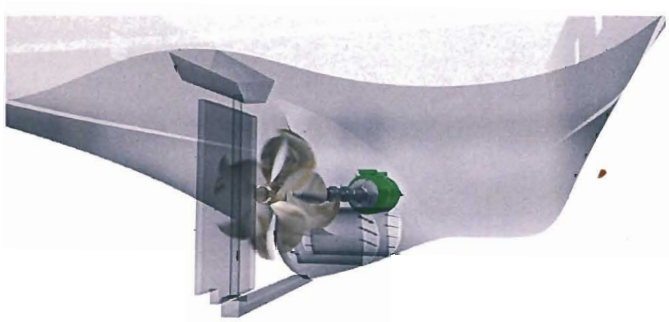
- Improved propulsion efficiency due to energy recovery from rotational flow in CRP system and higher hull efficiency from a single skeg versus twin screw vessel.
- Fixed pitch propeller system with few movable parts, directly driven from the slow speed PM motors.
- The propeller is protected behind the center skeg far from the ship side, while the propeller tip is well above the baseline and further protected by a solepiece.

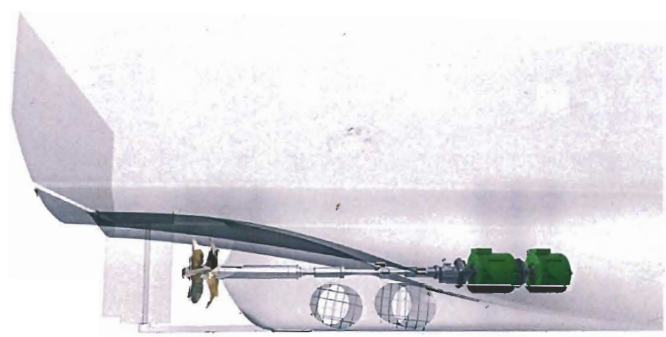
Permanent Magnet Motor

In collaboration with Inpower, Scana's Permanent Magnet Motor is designed to operate the vessel from zero to full speed.

The compactness of the propulsion system enables the ship's major benefits through:

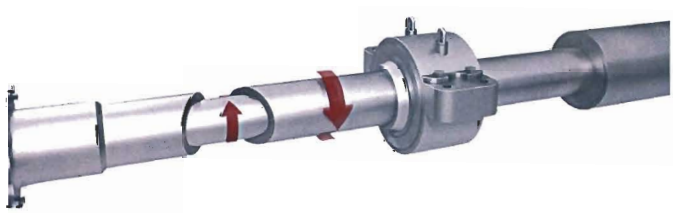
- Installation
- Operations
- Service & Maintenance
- Low Noise
- Low Fuel Consumption





Shaft-in-Shaft

Independently driven propellers through a unique shaft-in-shaft system which complies with IMO DP2.



Bearings & Shaft Seals

Hydrostatic lubricated bearings and shaft seals according to DnV Clean Design.

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