



Propeller & Shafting System

Innovating Today, Leading Tomorrow



Head Office & Plant 1

#34, NokSanSandan 17-Ro 14Beon-Gil, Ganseo-Gu, Busan, 46751, Korea

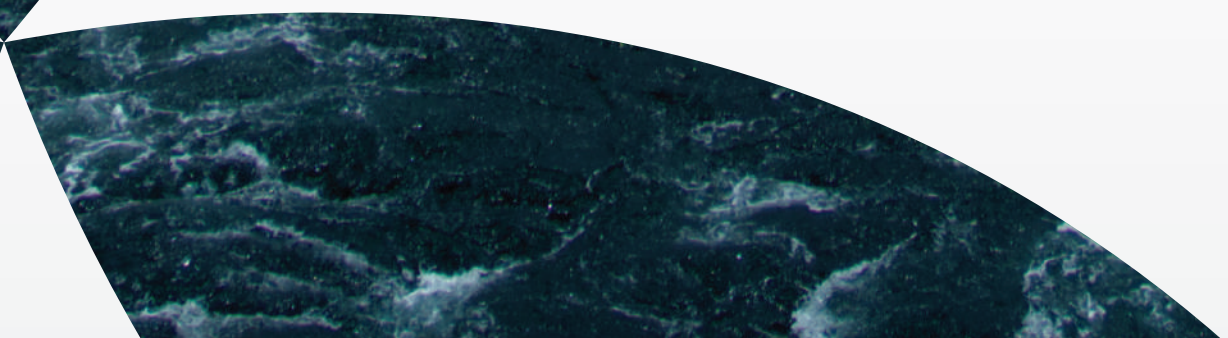
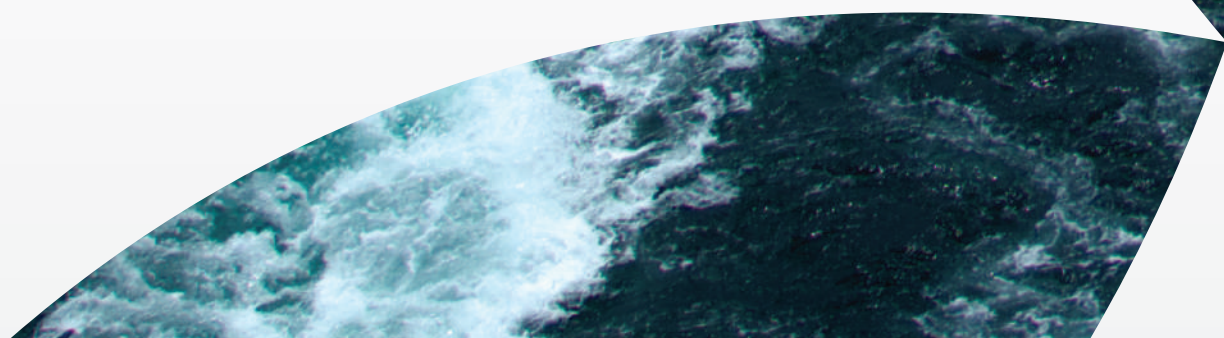
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Plant 2

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CEO MESSAGE

Since its establishment in 1975, Silla Metal has grown-up into current Silla Metal Ltd. through continuous technology development and facility modification and expansion. Needless to say, propeller and propulsion shaft system are one of the most essential devices on a ship. In line with this importance, the propeller requires excellent durability and product reliability. We produce the best products that satisfy the importance of these products in accordance with the characteristics of each size and type of vessel such as VLCC, LNGC, Containers, etc. In order to make these high-end products, Silla Metal has been constantly working on research and development and product quality improvement. From the propellers for commercial vessels to the CPP for military and special purpose vessels, Silla Metal promises to manufacture a quality product that exceeds the needs of customers and do its best as a world class propeller manufacturer.

President of SILLA METAL Kim, Hyung-Jin

SILLA METAL

Silla Metal has inherited the Genes of Silla Kingdom and strives to the excellence of foundry, casting and metalwork.



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QUALITY MANAGEMENT

Silla Metal is producing high-quality marine propulsion system from the factory which has been certified by the world's leading classification such as LR, BV, RINA, ABS, DNV, NK, RS, KR, etc. All manufacturing are conducted in an automated plant in head quarter and finish work are done delicately by hand work of the skilled technician having more than 10 years of experience. In order to ensure the highest quality, Silla Metal controls entire process starting from selection of raw material, design, until manufacturing in accordance with IOS 9001 Quality Management System, IOS 14001 Environmental Management System, and ISO 45001.

CERTIFICATES



ABS



BV



DNV



KR



LR



RS



NK



RINA



ISO 9001



ISO 14001



ISO 45001



WPS



1970's



1980's



1990's



2000's

SILLA METAL HISTORY

- 1975.01 SILLA METAL industries established (Namhang-dong, Yeongdo-gu, Busan)
- 1978.04 Registered as the specialized plant for shipbuilding material by the Commerce-Industry Ministry
- 1978.06 Registered as the company that supplies to the Navy and to the Marine Police
- 1979.05 Developed propeller for special high speed small vessel (Ministry of National Defense)

- 1981.85 Conferred with letter of appreciation from head of the Defense Procurement Agency
- 1983.08 Registered as the quality improvement company by the Commerce-Industry Ministry
- 1986.06 Formed technology alliance with Japan's KAMOME concerning propeller technology
- 1988.07 Incorporation of going business (SILLA METAL CO.,LTD)

- 1990.04 Designated as cutting edge technological industry
- 1990.07 Approval for the KCX.MSC blade development business
- 1991.09 Signed technology alliance with Germany's SULZER ESCHER WYSS GMBH
- 1992.07 Awarded commendation "Trade Day" from Minister of the Commerce
- 1995.10 Produced CPP & HUB for 3,000 Ton class ROKN First destroyer
- 1995.11 Awarded commendation "Development of outstanding capital goods" from the President of Korea
- 1997.01 Produced CPP & HUB for 5,000 Ton class destroyer

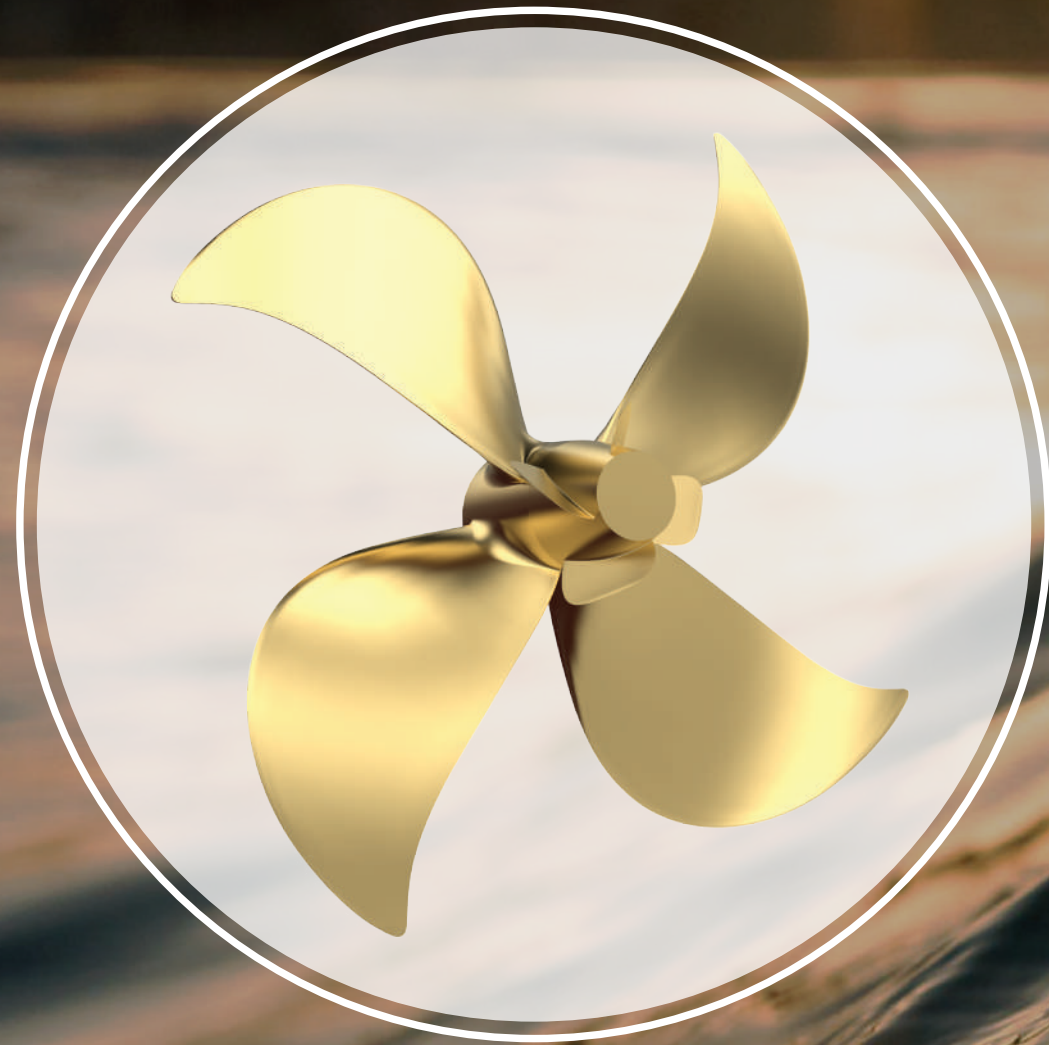
- 2004.11 Produced CPP & HUB for large landing ship (LPH 6111)
- 2006.07 Produced CPP & HUB for 10,000 Ton class AEGIS vessel
- 2007.01 Achieved certification of company attached R&D center
- 2007.06 Selected as the leading company in Busan in the strategic business industry
- 2007.09 Registered as company specialized in components and materials
- 2008.09 Established plant No. 2 (Sinpyeong-dong, Saha-gu, Busan)
- 2008.12 Marine Propulsion (Propeller and Shaft) 3,000 set production

- 2012.03 Awarded commendation "Best Taxpayer" from the Minister of Strategy and Finance
- 2012.04 Registered as Inno-Biz
- 2012.06 Development of Fuel Saving Propeller Cap
- 2012.07 Production of FPP with a weight of 75 Ton
- 2012.12 Delivered 7.9m Dia. Twin propellers for 170K CBM LNGC
- 2014.07 Selected as a Root-Technology Company by SMBA
- 2015.03 Acquired a patent for CPP Hub Assembly
- 2018.04 Development of 150kW class RIM Driven Electronic Propulsion System
- 2018.04 Delivered 10.4m Dia. propeller for VLCC
- 2018.04 Delivered 8.4m Dia. Twin propellers for 180K CBM LNGC
- 2018.09 Awarded commendation "Development of capital goods" from the Ministry of Trade, Industry and Energy (MOTIE)
- 2019.01 Delivered 10.6m Dia. propeller for VLCC
- 2017~22 2,800ton class frigate / CPP Complete System (#1~8)

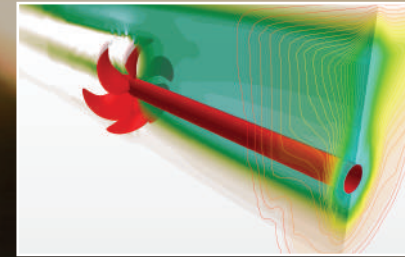
- 2023.05 Expansion of production Capacity (New "F" Plant)
- 2023.05 Set up High Performance Computing (HPC) system with SIEMENS STAR-CCM+
- 2023 3,000 ton class KCG / CPP Complete System (#1~2)

BUSINESS OVERVIEW

Silla Metal Co., Ltd is a company founded in 1975 producing Propeller and Shafting and it has grown to be the largest scale in the Republic of Korea on single company basis. Up to now, we've delivered more than 3,000 units of propulsions to various types of commercial vessels to worldwide. We are the only company supplying propulsions for ROKN and KCG and have exported our propulsions to a number of foreign navies and coast guards around the world.



“Launch your dream
with SILLA METAL”



Design and Technical support

Silla Metal utilizes state-of-the-art design systems supported by deep knowledge of hydrodynamics and manufacturing to provide customers with the optimal propeller design solutions tailored to their vessel operating conditions. Our technological solution ensures optimal propeller performance with excellent efficiency, cavitation, vibration, and noise performance.

- Optimal propeller design
- Hydrodynamic performance analysis (propulsive efficiency, cavitation, noise) using numerical simulation (CFD)
- Propeller redesign and retrofit for EEXI and CII improvement
- Technical support on energy saving measures
- Remedy solution of damaged propeller



Shafting

We are producing Shafting for Water-lubricated System, Oil-lubricated System reflecting the characteristic of the vessel. Furthermore, from the beginning of our establishment, we have produced Propeller and Shaft as a package and maximized the efficiency of the vessel operation.

- Propeller Shaft and Intermediate Shaft
- Hydraulic Nut and Ring
- Coupling Bolt and Nut
- Stern Equipment



FPP

Based on long experience, Silla Metal is custom-making ship propeller suitable for each type of vessel such as VLCC, LNGC, Container Carrier, Tanker, Bulk Carrier, Cruise ship and Special ship.

Our precise and specialized equipment produces propulsions according to the drawing optimally designed for the characteristic of the vessel.



S-CAP

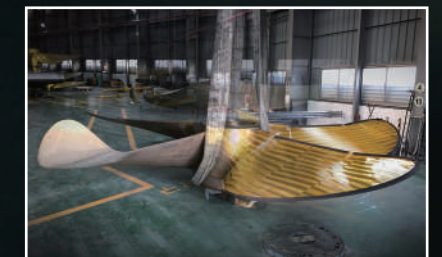
Silla Metal developed its own patent technology of propeller cap with fins. The propeller inflow swirls in the direction of propeller rotation. This swirl creates propeller hub vortex, which causes local pressure drop and thus induces pressure drag. S-CAP recovers the pressure drag by reducing the vortex strength by counter-rotating the swirl.



CPP

Our Controllable Pitch Propeller has high accuracy and reliability, and is suitable for each type of vessel, such as Naval vessels, Patrol vessels, and Special purpose vessels.

Our own models are also ready for operation and numbers of global top class CPP manufacturers have also cooperated.



Repair

Providing periodically cleaning and maintenance service for ship's performance. Long history and numerous experience /know how of repairing the propulsion. Our Service Engineer is always with our product all over the world.

- Propeller edge modification afloat
- Repair for the fracture of propeller blade
- Repair for the large bending of propeller blade

“Advancing as the World’s Best Company”

Foundry shop is possessing furnace with the capacity of 160Tons in total and is able to produce high quality Propeller with the experience on casting and differentiated technology accumulated for 50 years. Propeller machining shop has been operated by automated equipment specialized in the production of Propulsion such as 3-Axis CNC Vertical Turning Centers, 5-Axis CNC Milling Machines, etc. Our products have been produced and supplied to meet various customer requirements in a timely manner by the combination of specialized equipment and high quality craftsmanship over the long period of time.

➤ PROCESS IMAGE



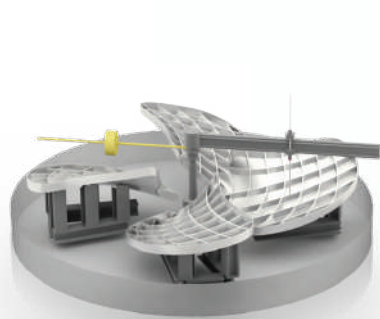
FACILITIES LIST

FACILITY	CAPACITY	Q'ty	MAKER
Furnace	160Tons	5	KOREA
Molding Pit	Up to 12,500	7	-
Ladle	130Tons(Total)	7	KOREA
Pitch Gage	Up to 11,000	13	KOREA
Lay-Out M/C	X:4,000 x Y:2,000 x Z:1,200	2	KOREA / JAPAN
Heavy Long Lathe	Ø1,200 x 12,000(L)	2	JAPAN
Radial Drilling M/C	30HP x 3,500(L)	1	KOREA
Floor Boring M/C	160T	1	KOREA
Vertical Turning M/C	Ø8,500 x 80Tons	1	KOREA
Vertical Turning M/C	Ø11,000 x 100Tons	1	KOREA
Propeller Blade Milling M/C	Ø8,500 x 80Tons	1	KOREA
Propeller Blade Milling M/C	Ø11,000 x 130Tons	1	KOREA
CPP Spin Test M/C	Ø6,000	1	KOREA

MANUFACTURING PROCESS

After designing the product in most suitable and efficient way for optimal operating condition, Propellers have been casted with minimum deformation resulted from long-experienced casting technology. High Quality Propulsions have been produced with the automated high accuracy machines.

1. Molding



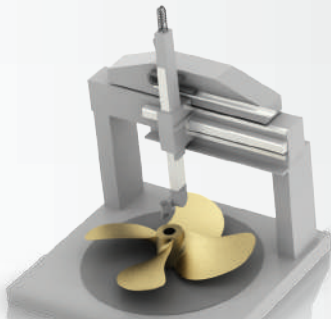
Sand Mold based on 3D modeling design is precisely made by skillful craftsmen.

2. Melting & Pouring



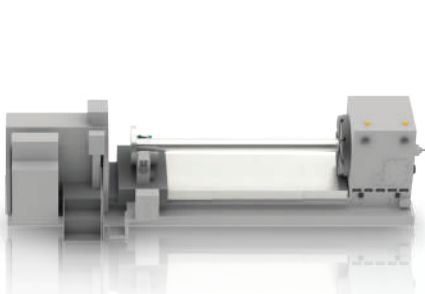
Dissolved copper alloy is inserted into Sand Mold by gravity of upper part (Total melting capacity : 160 Tons).

3. Propeller Machining



Boss processing is done by CNC Vertical Turning Lathe. Surface of the blade is processed by 5-Axis CNC Milling Machine based on 3D modeling.

4. Shaft Machining



Shaft Machining is done by the CNC Horizontal Lathe with the qualified material.

5. Contact Test



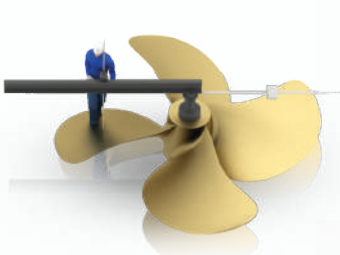
By using actual propeller shaft or cone gauge

6. Finishing with Polishing



Both surface of blade and boss are polished up smoothly by skilled workers.

7. Inspection & Shipment



Balancing, Dimension/Pitch and Surface Inspection are done in the witness of Surveyor.

“Specialized equipment and high quality craftsmanship”

“Newly beginning, we always pursue the best”

Silla Metal's Propeller is designed and manufactured in accord with type and characteristic of vessel, engine type and customer requirement.



FPP(Fixed Pitch Propeller)

- Maximum Diameter : 11m
- Maximum weight after processing : 90Tons
- 80 propellers per year for large LNG carriers.
- For 50 years with high reputation of performance and quality.



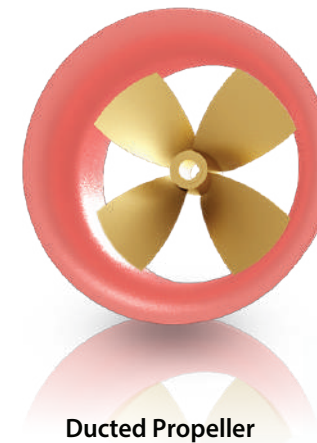
4 Blades Propeller



5 Blades Propeller



6 Blades Propeller



Ducted Propeller



High-Skew Propeller

None of the ship Propeller has same design and it is molded with unique design matching with the purpose of the vessel from the casting stage. Silla Metal has been designing and manufacturing optimum Propeller suitable for the operation condition of the vessel from small boats to large vessels.



SHAFTING

In addition to Propeller and Shaft, Silla Metal can supply all Stern Equipment related with Shafting system. Since Package is supplied together with Propeller to maximize the efficiency of the engine, best operating condition is guaranteed.

- Stern Equipment
 - Stern Tube, Stern Tube Seal, Stern Tube Bearing, Coupling, Intermediate Shaft Bearing, Nozzle, Shaft Ground Device, Sleeve, Bracket, Rudder Stock, Propeller Cap, Rope Guard, Hydraulic Nut
- Other Copper Alloy Casting



S-CAP



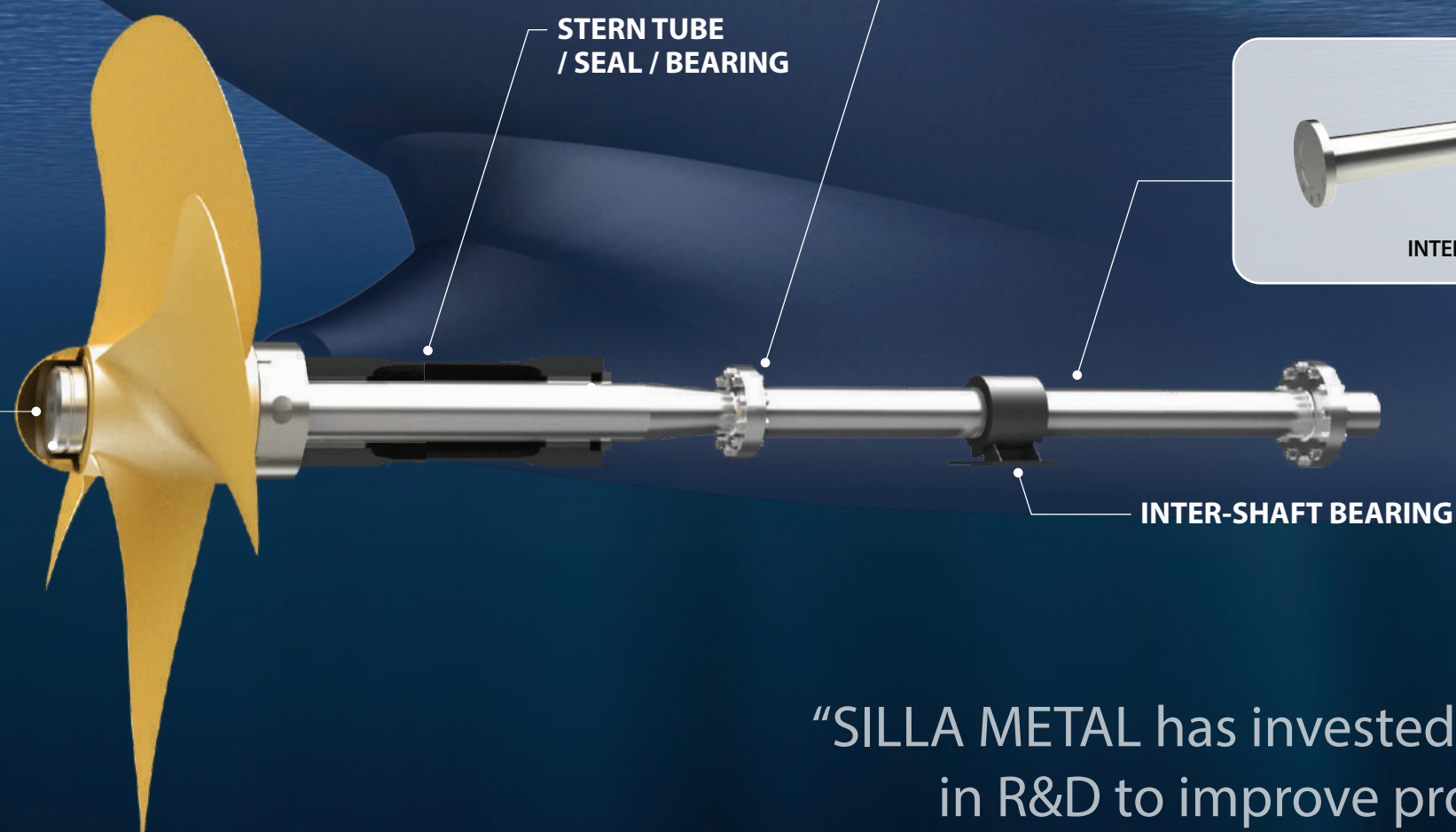
STRAIGHT



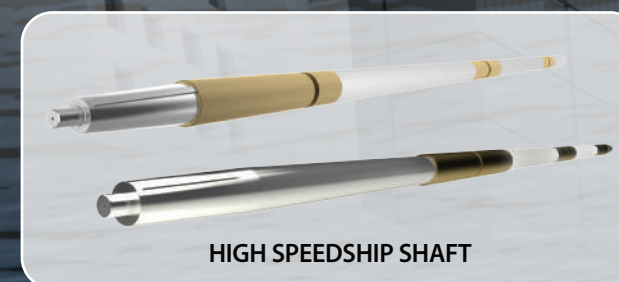
DIVERGENT

COMPATIBLE WITH
RUDDER BULB

PROPELLER CAP

STERN TUBE
/ SEAL / BEARING

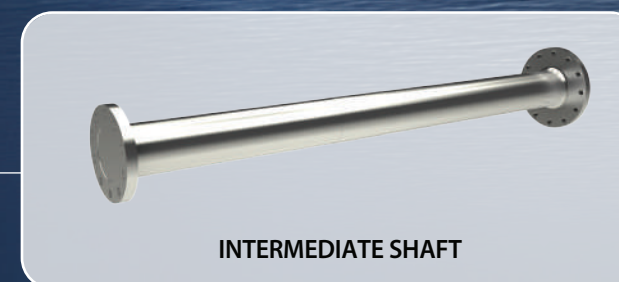
INTER-SHAFT BEARING



HIGH SPEEDSHIP SHAFT



PROPELLER SHAFT



INTERMEDIATE SHAFT

“SILLA METAL has invested continuously in R&D to improve product quality”

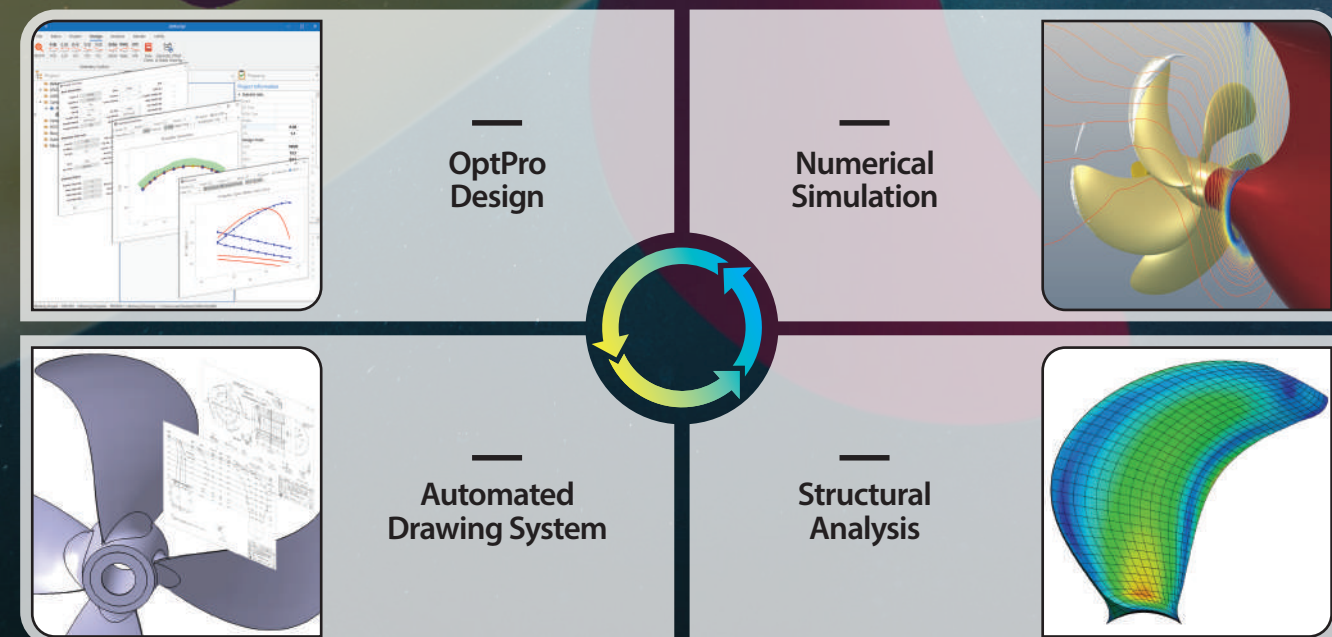
S-OptPro(Silla Metal Technology for Optimizing Propeller)

Reducing propulsive losses is recognized as a fundamental strategy to lower fuel consumption and comply with crucial IMO regulations, including EEXI, CII, and EEDI. Optimizing propellers is identified as a cost-effective and powerful approach for vessel operators facing the urgent need to adopt solutions that align with the more stringent emission reduction targets set forth in the revised IMO Greenhouse Gas (GHG) strategy. Silla Metal Technology for optimizing propeller(S-OptPro) help you to meet these requirements by reducing fuel consumption and emissions.

State-of-the-art Design System

- Propeller Design & Performance Analysis System

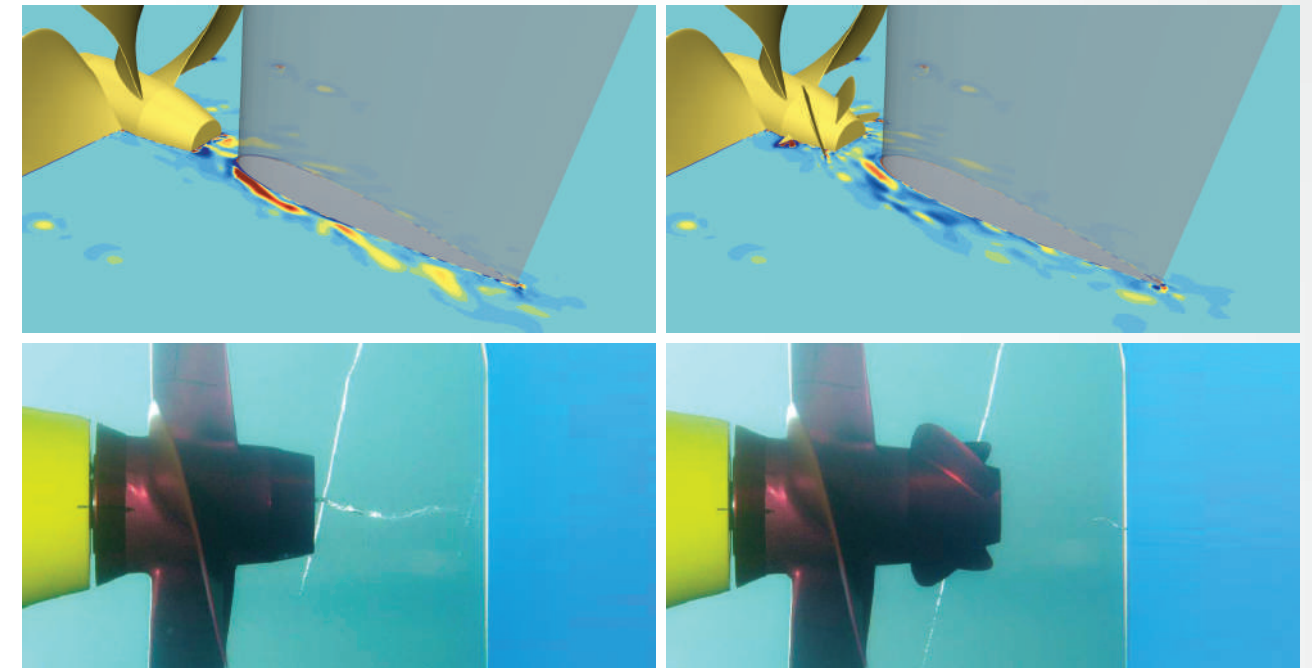
- OptPro Design : Propeller Optimization Design System
- Numerical Simulation : Simcenter STAR-CCM+
- High Performance Computing (HPC) : Intel® Server System
- High accuracy performance analysis : Resistance, Self-propulsion, Cavitation, Pressure pulse, Noise, Hydrodynamic forces



"Silla Metal Integrated Propeller Optimization Design System"

S-CAP(Silla Metal energy Saving Cap)

Silla Metal developed its own patent technology of propeller cap with fins. The propeller inflow swirls in the direction of propeller rotation. This swirl creates propeller hub vortex, which causes local pressure drop and thus induces pressure drag. S-CAP recovers the pressure drag by reducing the vortex strength by counter-rotating the swirl.



➤ Main features of S-CAP

- Full parametric optimization design using CFD computation at full scale.
- Propeller efficiency increased (up to 2% ~ 3% fuel saving).
- Reduced risk of rudder erosion, propeller noise, and vibration.
- Easy Installation.
- Lower cost compared to other energy-saving devices.



Kind of Ship	4300Unit Car Carrier	176K Bulk Carrier	MULTI-PURPOSED SHIP	300,000 TDW Crude Oil Tanker
Fin Dia.(mm)	1,575	1,970	710	2,445
Z(EA)	5	4	4	4
Photo				

The only manufacturer of the Controllable Pitch Propeller(CPP)

Silla Metal manufacture and supply blades and hubs for Controllable Pitch Propeller for most domestically built Navy and Coast Guard ships, with a track record of manufacturing and maintaining CPP system.

> Reference list

DDG, DDH	FFG, PCC	LST, LPH	Coast Guard
DDG (4+2) DDH-II (6) DDH-I (3)	FFG-III (1+5) FFG-II (8) FFG-I (6) PCC (4)	LST-II (4) LST-I (3) LPH (2)	KCG 1,000 (5)
			KCG 1,500 (10)
AOE, ASR, ATS, AGX	PKM, PGM	MLS, MHC	
AOE-II (1) AOE-I (3) ASR-I (1) ASR-II (1) ATS-II (1) AGX-II (1)	PKM (70) PGM (2)	1MLS (1) MHC (3)	KCG 3,000 (12)
			KCG 5,000 (2)



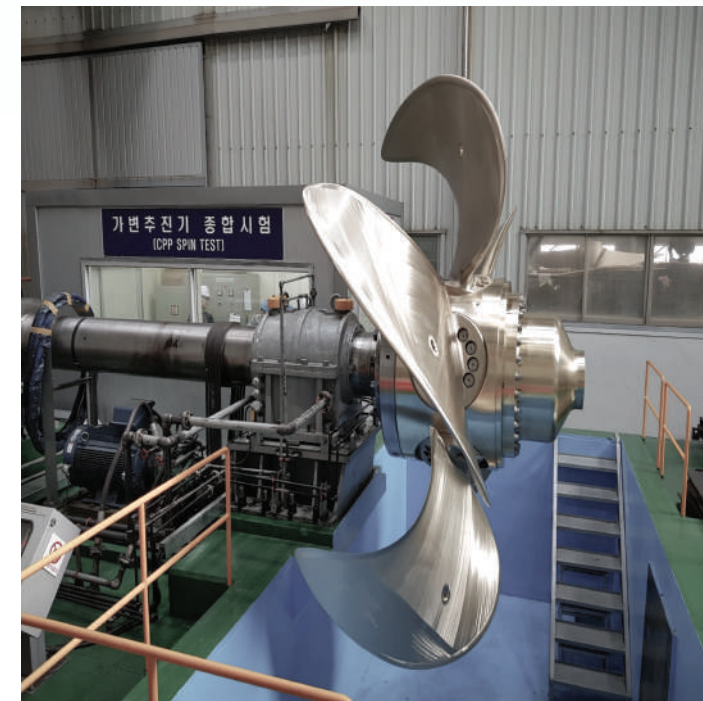
REPUBLIC OF KOREA NAVY



KOREA COAST GUARD



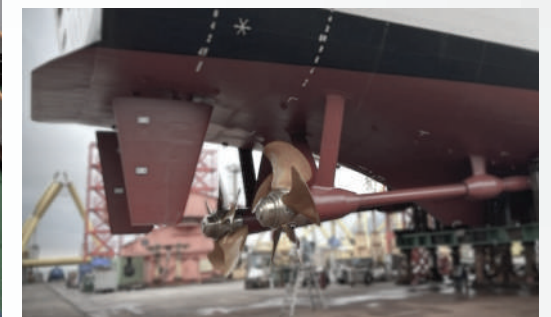
Silla Metal have been supplying the KaMeWa CPP full system to the Republic of Korea Navy and Coast Guard ships through technical cooperation production with Kongsberg Maritime Sweden AB (KMAB).



> CPP Test Facility of Silla Metal

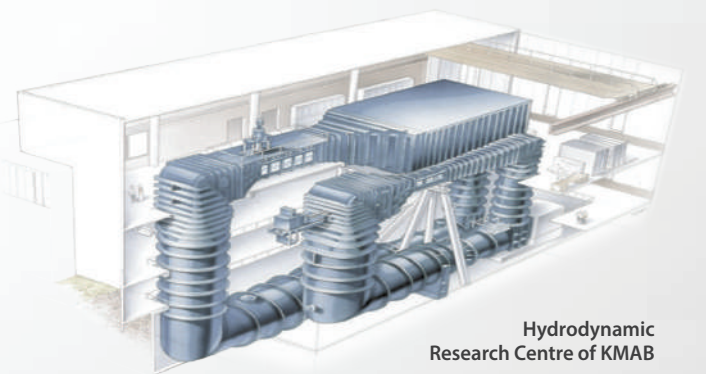
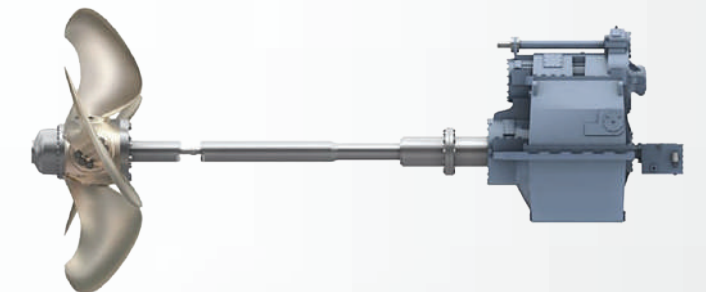
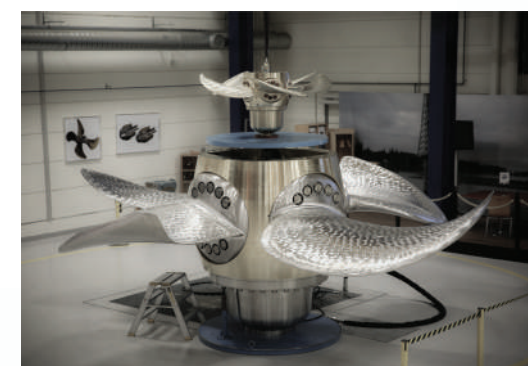


> Daegu Class Frigate (2021)



> 3,000 Ton Class OPV (2023)

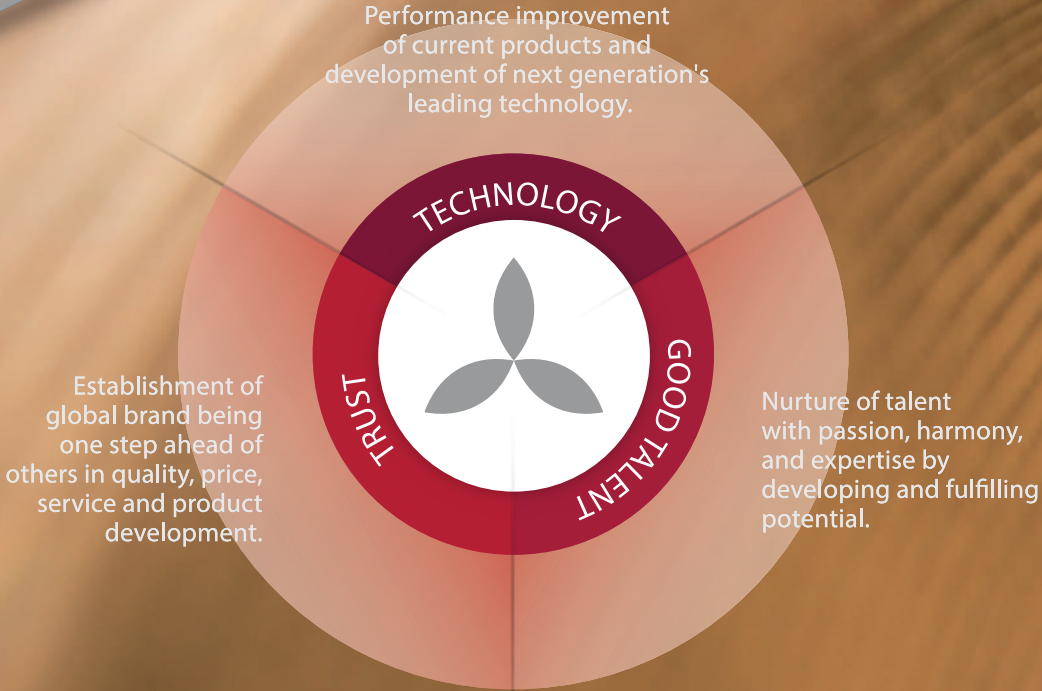
Over the years, KaMeWa CPP has delivered more than 10,000 main propellers worldwide, over 10 percent of those have been delivered to governmental service, navy, coastguards, etc. The experience gathered over 80+years is stored in, and readily available through the propulsor performance database at KMAB's unique Hydrodynamic Research Centre(HRC).



Hydrodynamic Research Centre of KMAB

World-wide class propulsion manufacturer

Silla Metal supports the development of potential capacity of each individual employee and fosters talented people with passion, harmony and professionalism. We value the trust with customer resulted from high quality, competitiveness and global service. Furthermore, we are leading the way to development of next generation technology such as high efficiency Propeller, energy saving device, new-generation propulsion system and so on.



FACTORIES A total area of 22,250m²

Silla Metal is handling all manufacturing processes from the casting of propeller to machining, finishing and final inspection. It is equipped with flexible production system to reflect the diverse needs of customers immediately and has been producing its own high quality propeller under the unified production management.



- A E F** Propeller Machining Shop
- B** Propeller Foundry Shop
- C** Shaft Machining Shop
- D** Propeller Polishing Shop
- G** Naval Propellers Test Shop
- H** Pattern Storage

OVERVIEW

Company Name	SILLA METAL CO.,LTD	No. of Employees	80
Business Field	Marine Propulsion	Address	#34, NokSanSandan 17-Ro 14Beon-Gil, Ganseo-Gu, Busan, 46751, Korea
Product	FPP & CPP, Shafting, Propeller Design & Retrofit	Telephone	+82-51-831-5991~8
Established Date	January 1, 1975	Fax	+82-51-831-5990
		E-mail	sales@sillametal.com
		Homepage	www.sillametal.com



Innovating Today, Leading Tomorrow

Silla Metal Technology for Optimizing Propeller.

Silla Metal Propeller Retrofit solution.

Silla Metal energy saving Cap.



S-OptPro

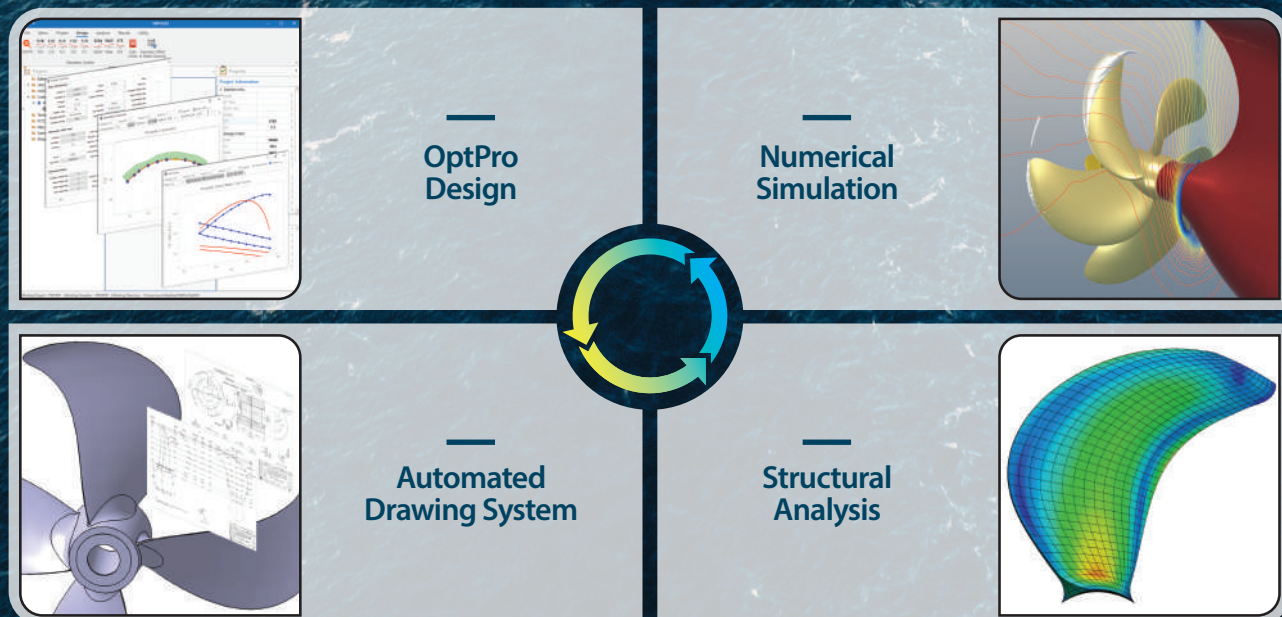
Silla Metal Technology for Optimizing Propeller.

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State-of-the-art Design System

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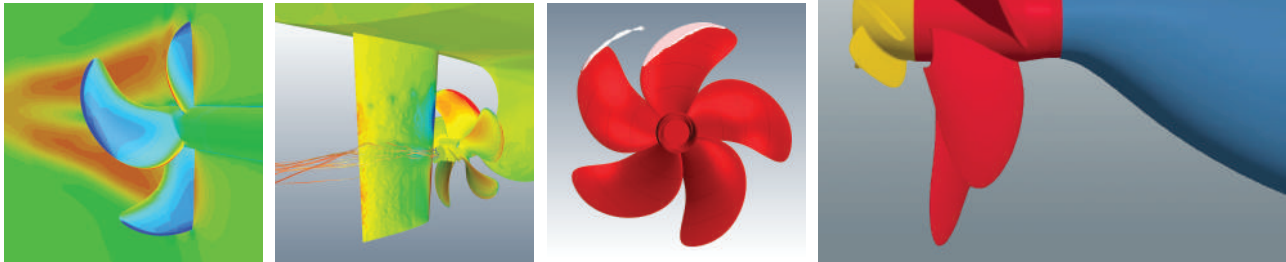


"Silla Metal Integrated Propeller Optimization Design System"

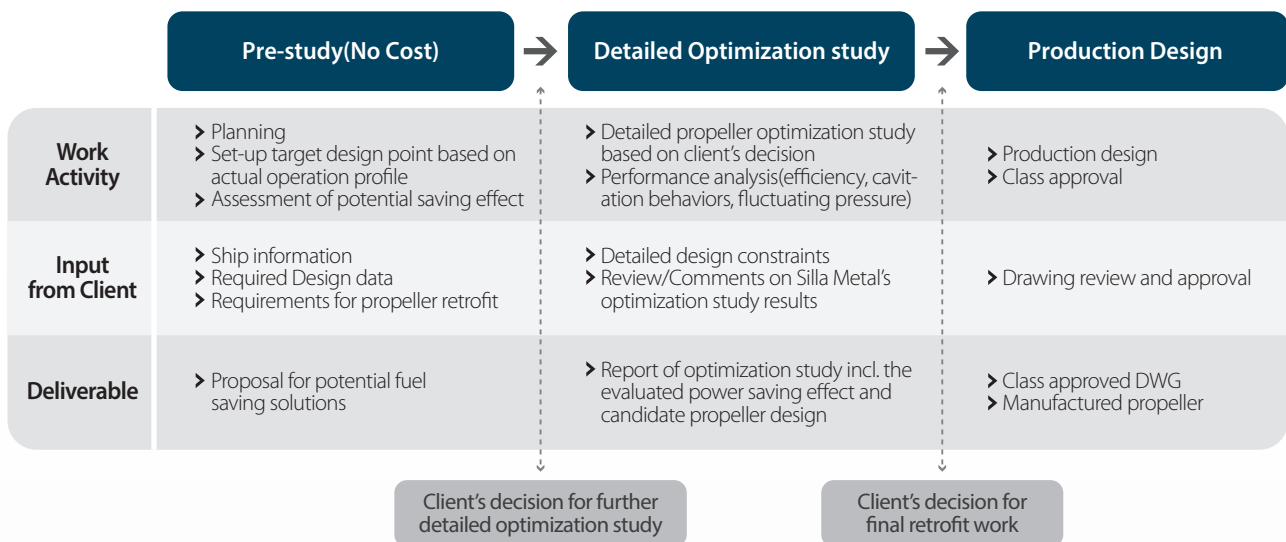
S-ProFit

Silla Metal Propeller Retrofit solution

Silla Metal offers S-ProFit solution, which enhances the CII and EEXI of existing vessels by replacing the old propeller with an optimal high-efficiency propeller design and S-CAP, incorporating the actual operational profile of the existing ships.



➤ Proposal of Silla Metal's propeller redesign and retrofit solution

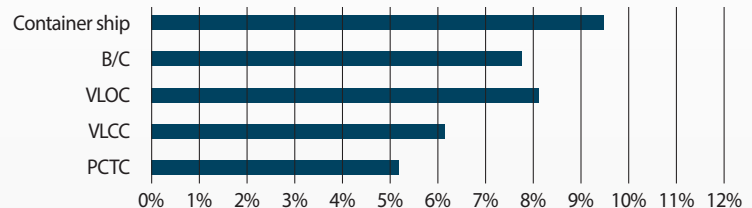


➤ Fuel and CO2 Savings with S-ProFit

Replacing existing propellers with S-ProFit solution provides substantial benefits along with reduced ship speeds and engine power. Feasibility studies on ships built 5 to 10 years ago show potential fuel savings of approximately 5% to 10%. The actual savings could be higher, considering the degraded performance due to aging and the rough condition of existing propellers.

Potential Saving of S-ProFit

5~10% Fuel Saving
3~6% EEXI improvement
2~4 years CII Compliance extension



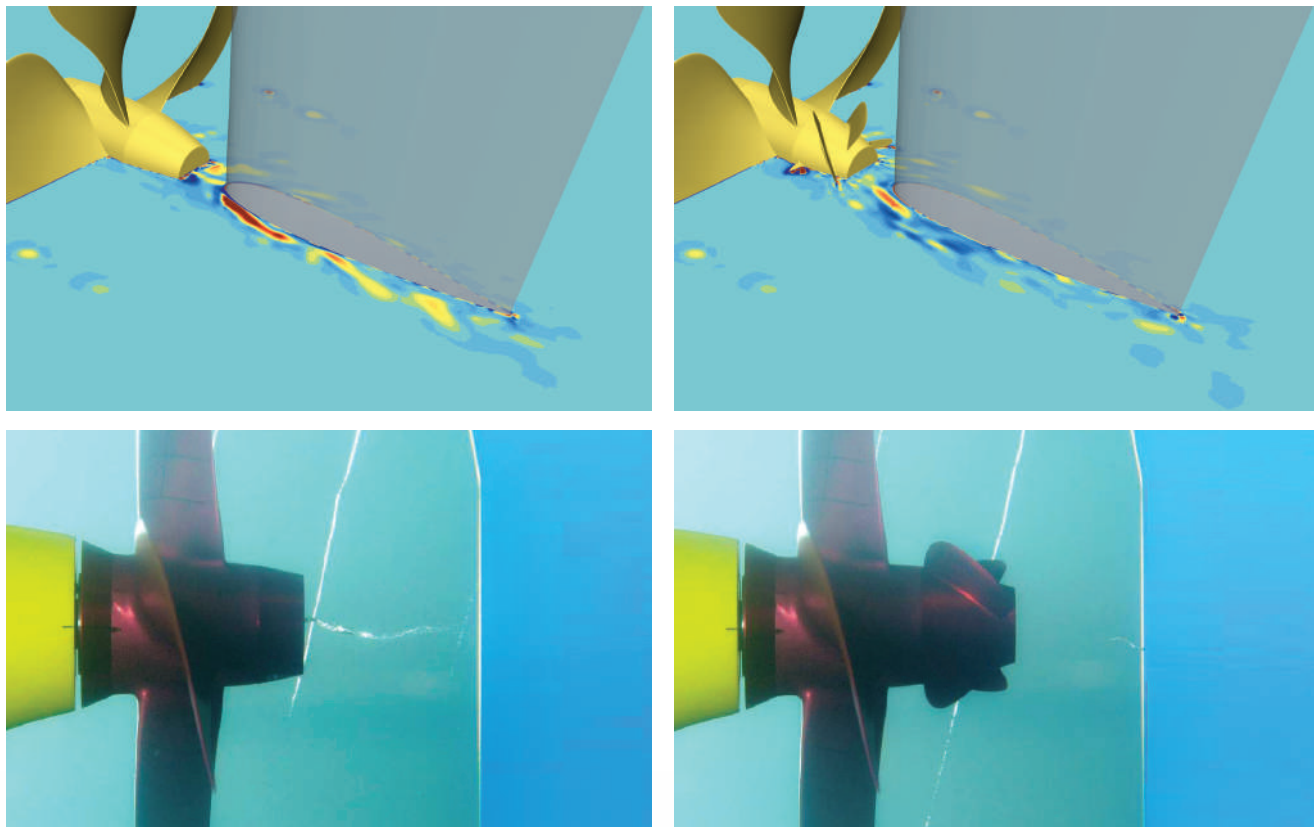
➤ Key benefits of S-ProFit

- Saving on fuel consumed for propulsion, while free from any cavitation damage and lower vibration levels.
- Improving EEXI and CII of existing ships.
- Shortening payback period from buying back existing propeller and reducing propeller weight from structural optimization.

S-CAP

Silla Metal energy saving Cap

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► Main features of S-CAP

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