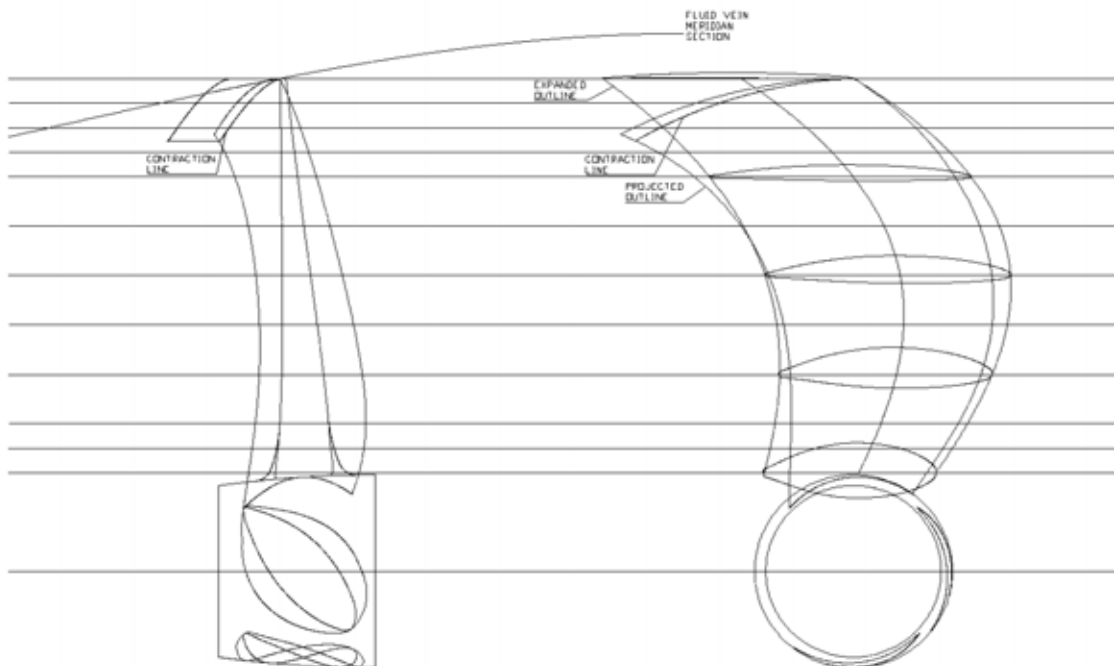


**Studio di Ingegneria Navale e Meccanica**

## **SISTEMAR CLT PROPELLERS**

**Presentation to  
The International Propeller Club Port of Genoa  
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Screw propulsion was invented by Bernoulli who, in 1752, patented a propeller made up of blades connected to a same hub. This propeller was not dissimilar from the present ones.

In 1855 Carles Augustus Holm won the Paris exhibition silver medal for the idea of folding the propeller tip backwards, toward the rudder.

But the systematic use of such folded tip has been introduced in 1893 only, when Prof. Gonzalo Perez Gomez and his colleagues, having completely revisited the screw propulsion theory, have published the “New Momentum Theory”, subsequently, this theory was published by SNAME in 1993. In 1995 Prof. Gonzalo Perez Gomez and his colleagues have published the “New Cascade Theory”, which takes into account the three dimensional cascade effects developing on a propeller blade.



The fundamental merits of this new theory are its extreme simplicity, its versatility and its generality. Even more so when compared with the contemporary theories (Lifting Line Theory and Lifting Surface Theory); theories not theoretically rigorous, extremely heavy on the computational side and lacking generality.

The limits of the contemporary theories can be underlined by two examples:

- The French nuclear aircraft carrier, R 91 Charles de Gaulle, the pride of the French Navy, which, during the maiden voyage, has broken both propellers;
- Some recent fast Ro-Ro/Pax vessels whose initially installed propellers were wrongly designed and which now sail with the second, or third or even fourth stage propeller design.

The New Momentum Theory enables not only to design conventional propellers, but also to design SISTEMAR CLT propellers (CLT stands for Contracted and Loaded Tip).

The advantages of SISTEMAR CLT propellers over conventional propellers are numerous, tried, tested and documented on more than 230 vessels:

- Higher efficiency (conservatively +8%)
  - Saving on fuel
  - Saving on MM/EE maintenance
  - Higher top speed
  - Greater range
- Inhibition of cavitation
- Inhibition of tip vortex
  - No noise
  - No vibration
- Greater thrust
  - Smaller propeller optimum diameter
  - Better manoeuvrability



Against all these advantages, it might come as a surprise, there is not a single disadvantage.

It is important to underline that the tip endplate is already largely employed by the aerospace industry (even though the advantages given by the fin to a wing are far less than the ones given by the fin to a marine propeller blade) and to state that some conventional propeller manufactures have tried to copy SISTEMAR CLT propellers, as far as they could due to knowledge and patent impediments, obtaining only limited advantages.



SISTEMAR CLT propeller, both of fix and controllable pitch type, are presently installed on more than 230 vessels:

Product carrier	8	Juice carrier	1	Fishing vessel	72
Cement carrier	2	Containership	7	Catamaran	5
Chemical carrier	7	Cruiser	2	Hydrofoil	3
Tanker	1	Ferry	19	Landing craft	3
Bulk carrier	17	Ro-Ro	7	Patrol boat	5
Multipurpose	1	Reefer	5	Oceanographic	2
General cargo	6	Trawler	57	Other	3

With a very wide application range:

- Up to 300.000 DWT;
- Up to 27 MW per propeller;
- Up to 36 knots.

The results of these installations have always confirmed the numerical calculation, proving the extreme accuracy of the new theoretical model.

The following references, relevant to both retrofittings and new buildings, have already being published on specialised magazines or presented in conferences.

#### **RETROFITTING**

<b>SHIP</b>	<b>TYPE</b>	<b>SIZE (DWT)</b>	<b>DATE</b>	<b>FUEL SAVING</b>
Rio Tinto	Tanker	270.000	1983 (TVF)	15 %
Munguia	Tanker	300.000	1984 (TVF)	15 %
Guardo	Bulk carriers	11.850	1990	16 %
Manjoya	Bulk carriers	11.850	1991	16 %
Milanos	Bulk carriers	11.850	1991	16 %
Sac Flix	Bulk carriers	15.700	1992	13 %
Sac Malaga	Bulk carriers	30.500	1992	13 %
Bebedouro	Juice carrier	12.000	1995	9 %
Comanche	Bulk carriers	164.000	1997	12 %
Cherokee	Bulk carriers	164.000	1997	12 %
Paiute	Bulk carriers	70.000	1998	11 %
Powhatan	Bulk carriers	70.000	1998	10 %

(Tip Vortex Free propellers – TFV – are the progenitors of CLT propellers)

As an average, the return of investment for retrofittings has been about two years.

In particular, retrofitting SISTEMAR CLT propellers does not pose any problem:

- For vessels equipped with fix pitch propellers, the hub of new CLT propeller will have the same geometry of the old one;
- For vessels equipped with controllable pitch propellers, the new CLT propeller blades will be fully compatible with the existent hub, thus it will only be necessary to substitute the propeller blade and to define a new combinator curve.

#### **NEW BUILDINGS**

<b>SHIP</b>	<b>TYPE</b>	<b>SIZE (DWT)</b>	<b>DATE</b>	<b>FUEL SAVING</b>
Goliath	Cement carrier	15.700	1993	14 %
Nakai 607	Tanker	5.000	1995	9 %

(Fuel saving over conventional propeller numerical calculation)

In particular Studio di Ingegneria Navale e Meccanica – SINM – has personally witnessed the sea trials of two sister ships, M/V Sicilia, equipped with a SISTEMAR CLT propeller, and M/V Kerel, equipped with a competitor's conventional propeller. The sea trials have confirmed, for the vessel equipped with SISTEMAR CLT propeller, an 8% decrease in fuel consumption together with a drastic reduction of the vibrations induced by the propeller on the stern frame.

One might ask himself why, despite the above mentioned brilliant results, SISTEMAR CLT propellers are not the present standard for screw propulsion.

There are two big obstacles:

The major propeller manufacturers own neither the patents nor the knowledge nor the “on filed” experience to design successfully such propellers, therefore they dismiss SISTEMAR CLT propeller advantages, despite partly copying them.

Ship Owners and technical managers in general are reluctant toward new technology and avoid taking decisions that would make their ships different from the others, despite running after emotional trends.

How can these resistances be won? And, above all, how to win the reluctance of the operators? It would be easy to answer “through knowledge”, but it is not so! It is more honest to affirm “through warranties”.

SISTEMAR, the Spanish design firm headed by Prof. Gonzalo Perez Gomez, the only firm capable of successfully designing such type of propellers, is therefore capable of giving its client, in case of retrofitting, full contractual and banking warranties.

In case of new buildings SISTEMAR gives the very same contractual warranties given by any other propeller designer. But in such case it is also necessary to win the approval of the shipyard, which might be even harder, as I have recently experimented while building two new fast Ro-Ro / Pax vessels.

### ***Conclusions***

SISTEMAR CLT propellers, due to their many advantages over conventional propellers, are a dominant choice for each and every new building, both from the shipyard point of view, who will be less exposed to claims related to noise, vibration, cavitation, contractual speed, and in the view of the ship owner, who will be able to achieve substantial savings on the running costs due to the higher propeller efficiency and lower maintenance costs.

SISTEMAR CLT propellers are extremely indicated for each and every ship experiencing noise, cavitation and stern frame vibrations, enabling not only a prompt and definite solution of such problems, but also to achieve a propulsion efficiency increase capable of quickly repaying the cost of investment.

Lastly, due to the important savings in running costs, SISTEMAR CLT propellers are also indicated for any existing vessel which, even if not subject to the above mentioned problems, is equipped with low efficiency conventional propeller, even more so when of old design.

Please contact us for further details

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