Biofouling Solutions for Marine Renewable Energy Convertors

Tidal Power & Wave Power

BIOCLEAN series are **biocide free** foul-releasing coating based on silicone polymer, which was first launched in 1981. It releases biofouling by creating micro-scale difference in the surface free energy. The water flows along the paint film in a circular movement. The environment is uncomfortable to marine life to stay.

Concept

- **Relative water speed to release biofouling**
- **Film hardness to avoid mechanical damages (impact, abrasion)**
- **Resistance to cavitation**

Chugoku has three paint products at present and characteristics of those products are as below table. In case of selecting paint, size and shape of the blades, maximum seawater speed, rotation frequency (RPM) shall be taken into consideration.
Chugoku is now developing new paint products which have characteristics targeting between the existing paint products.

Paint Name	BIOCLEAN ECO		BIOCLEAN HB		BIOCLEAN R
Usage	● Static structures ● Natural seawater movement		● Ship hull outside		● Propeller and rudder
Water speed	0.5m/s	(*1)	5.0m/s	(*1)	7.0m/s
Film hardness	Softer ←				→ Harder
Cavitation resistance	Poor ←		Good →		Excellent

(*1) Prototype paints specialized for MREC are under co-development with Tokyo University.

CHUGOKU MARINE PAINTS, LTD.
Offshore Sales Department
Mail:https://www.cmp.co.jp/global/contact_global.html

Since 1917 100th Anniversary

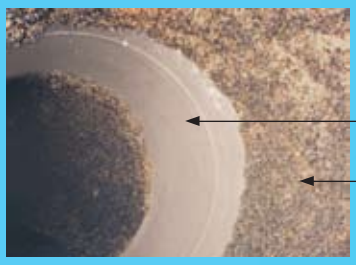
CMP CHUGOKU

Silicone resin foul-releasing paint

BIOCLEAN

Offshore facilities are facing troubles with biofoulings, which interferes the operation of seawater treatment, reduces speed / increases fuel consumption of marine vessels, causes extra stress to the mooring systems, etc. Chugoku released BIOCLEAN, a biocide-free silicone resin biofouling control paint in 1981. Three paint products with different characteristics perform foul-releasing effectively in various marine environment.

Foul-release effect

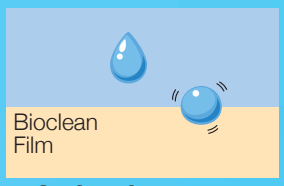


After 4 years operation (Sea water intake pipeline)

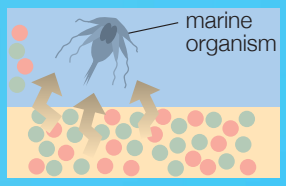
BIOCLEAN

Anti-corrosive paint film

Characteristics for Foul-releasing



Surface free energy



Micro surface separation

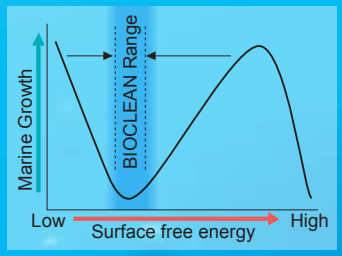
Synergy Effect

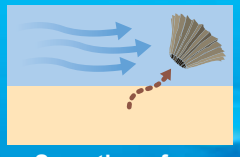
Surface free energy and ***Micro surface separation***

"BIOCLEAN" is the biocide-free silicone resin foul-releasing paint having the longest history in the world. Chugoku found the relativity between surface free energy of paint film and biofoulings. It had been proven during our 40-years research in silicone that a paint film releases biofoulings very effectively when the surface free energy is inside of the specific narrow range. Chugoku added an extra-ordinal function to BIOCLEAN besides designing surface free energy within the best range in the macro-constitution.

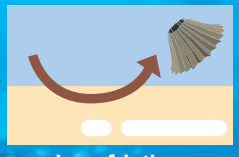
In the micro-constitution, various types of silicones having different range of surface free energy appears randomly on the paint surface. We named it "micro surface separation".

On the micro-separated surface, water flows in a turbulent and water pressure varies randomly. By the synergy effect of ideal surface free energy and micro separated surface, the surface is difficult for marine organism to live and to grow.

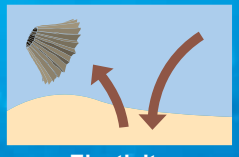




Smooth surface



Low friction

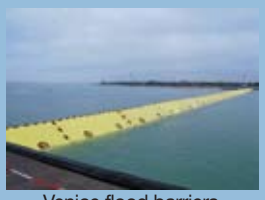


Elasticity

Very Slow Water Flow

BIOCLEAN ECO

is recommended for offshore facilities which are operated in very slow water flow. It needs only 1 knot (0.5m/s) to release biofoulings.



Venice flood barriers

Bar screen

Wave rudder energy convertor

Tidal energy convertor

General Marine Use

CMP BIOCLEAN HB

is recommended for high speed marine vessels. Foul-releasing performance and smooth surface reduce fuel consumption.

Cavitation Resistance

CMP BIOCLEAN R

is recommended for propellers, rudders, tidal power convertors, etc.

It avoids damages caused by vapor cavitation.

A seal taking a nap on the rudder coated with CMP Bioclean