

MV Hoegh America – Pilot experiment Report

On the use of a HydroPath **MARINE** equipment on a Fresh Water Generator unit

Abbreviations

FWG=Fresh Water Generator

EJB=Electrical Junction Box

MT = Metric Tonnes

A. The Client

Ray Car Carrier Ltd

APV (FWG maker) is informed and will be given a full report of the pilot.

B. Ship's Management Company

Stamco Ship Management Ltd Piraeus Greece

C. The System Installed

HydroPath MARINE HM-100

D. Purpose of the Pilot Experiment

The purpose of this experiment was to verify the overall efficiency of the HydroPath MARINE technology on marine applications.

The system is meant to prevent the built-up of limescale precipitation in the FWG, thus replacing the use of chemicals and the labor intensive cleaning frequency usually associated with the routine maintenance of the FWG unit.

E. Date and Place of Installation

December 10th2012, 0930-1500 hours.

The ship was at the Port of Tyne U.K whilst installation of the unit took place.

F. Date and Place of Inspection

June 30th 2013, 0830-1000 hours, six months from the date of installation. The ship was at the Port of Piraeus whilst inspection took place.



Figure 1.MV Hoegh America

G. The FWG

The FWG makers are APV and it has a production capacity of 25 MT per day when in top notch condition and this drops in direct correlation with the limescale accumulation on the titanium plates.

H. The Installation of the HydroPath MARINE Unit

On the day of installation, the FWG was opened, although its indicator did not show any reduction of the water production. Last opening and cleaning was recorded on May 2012.

The FWG was treated with chemicals (Liquidewt) on a regular basis by dosing pump, as instructed by the ship managers. Despite that, on most plates of the heat exchanger, it was found that there was a built-up of lime scale, up to 3 mm thick (figure 2).



Figure 2.Limescale precipitation on the titanium heat exchanger plates prior to the installation.

According to the chief engineer, cleaning process can take 24-48 hours. This depends on the amount of lime scale accumulation and built-up. The Cleaning process includes:

1. Plates are dipped in a chemical (Drew Enviromate 2000) and brushed to remove soft dirt and slime (figure 4).
2. Plates are dipped in a chemical (Liquidwt) to soften the limescale, which is later being carved out with a sharp ended tool made of a copper pipe (figure 5).



Figure 3.FWG plates while opening covered with slime



Figure 4.Left: Drew Enviromate 2000 – multipurpose cleaning. Right: Plate is brushed to remove dirt.



Figure 5.Left: Chemical used to soften limescale. Right: Carving out limescale

I. The Pilot Experiment Goal

The goal of this pilot experiment meant that a success is reached upon, in case that the manual cleaning and removing of clinging lime scale from the FWG plates, is saved, let alone the reduction and/or elimination of the use of chemicals as described. The end result is of course saving labor and material costs as well as potential damages to the plates during manual cleaning.

J. Location of the Installation

The HydroPath MARINE unit was installed on a 4" pipe, providing sea water to the FWG, approximately 1 meter before the inlet to FWG.

The system was installed slightly backwards from where it should have been placed, in order to protect it from wetness, whilst opening the FWG. The system is connected to an EJB connection/ junction box as seen on figure 6. The EJB connection/ junction box is connected to the main power cabinet of the FWG as seen in figure 7.



Figure 6.Left: System experimental installation location. Right: System is connected to an EJB connection.



Figure 7.FWG main power cabinet and cable connection

K. Pre Installation Checking Process

1. The HydroPath MARINE system was assembled to pre-check the electric signal. Peak to peak was 68-78v.
2. The HydroPath MARINE system was installed on location. Peak to peak was same as pre-check.

L. The Inspection after the Experimental Pilot Period

1. During the period of the pilot experiment, there was not any evidence of change in the water production of the FWG and it remained throughout the period at 25 MT per Day.
2. On June 30th2013, the FWG was opened for inspection, in the presence of Ship managers' superintendent and fleet manager, as well as the chief engineer of the vessel.
3. When the FWG cover was first unscrewed, the water which was released was very clear with no mud or signs of murkiness.
4. Most of the plates were found clean and had no limescale built-up on them. On several plates, there were areas of very loose limescale built-up, which was easily removed with a gentle hand touch or shake off of the plate and without any chemicals or carving process (as seen on figure 9).
5. The FWG chamber on the sea water side was also clean and contained no limescale, mud or slime.
6. The entire opening, cleaning and closing process, took slightly less than two hours (instead of 24-48 hours).
7. It should be emphasized that during the entire period of this pilot experiment, there was no use of chemicals dozing into the FWG and the dozing pump was disabled.



Figure 8.System is opened and cover is removed. Water released is clear.



Figure 9.Some plates had limescale on them, but it was easily removed by hand



Figure 10.Left: December 2012 – before installation, plates are covered with slime. Right: FWG plates (different FWG unit) treated with chemicals but covered with limescale and slime.



Figure 11. June 2013 – after installation, of the HydroPath MARINE unit the plates are clean.



Figure 12. June 2013 – FWG chamber (where plates are mounted) treated with HydroPath MARINE technology without any limescale or slime.

M. Pilot Results and Conclusions

After more than six months of using HydroPath MARINE technology on the FWG unit we could see the following improvements:

1. Throughout the pilot period there was no decrease in fresh water production of the FWG (normally production reduces over time due to clogged passages and accumulation of hard lime scale clinging to the plates).
2. During the opening of the FWG, the water released from the FWG was clear and did not contain any mud or slime, which showed clearly that any live organism was effectively eliminated by the HydroPath MARINE system.

3. Most of the plates were perfectly clean. A few plates had areas of limescale buildup on them, with a certain pattern (see explanation below), but this lime scale was very loose and was easily and smoothly removed by a hand touch.
4. The part of the chamber where the plates were mounted was absolutely clean. The part that was not in touch with the treated water was found with thin mill scale.
5. The entire cleaning process took less than two hours and did not require any use of chemicals or carving tools that very often cause damages to the plates. A gentle shake of the several plates was enough to drop the lime scale which was found on a few plates. (see explanation below)
6. HydroPath MARINE system is a combined solution for both lime scale and bacteria, as it is proven to be effective in bacteria elimination. The sea water used in the FWG contains bacteria which create a layer of algae on the plates. When heating the water to 70°C as part of the process, bacteria are killed and become slime. When eliminating bacteria to begin with, there is no slime, thus keeping both the FWG unit and the fresh water tank cleaner.

N. Summary

From the results described above, we can conclude that using HydroPath MARINE technology on the FWG, proved itself with successful results, since it clearly proved that this way of maintenance of the FWG, is advantageous, rather than the current method of the constant chemical dosing and a periodical manual cleaning with carving tools, which apart from being labor intensive, it often causes damages to the plates when carving tools are being used.

The presence of limescale on several of the plates is a temporary phenomenon to start with and is explained as follows:

1. It should be recognized that the HydroPath MARINE technology is based on a signal that runs back and forth within the water pipe, from the installation point of the unit in both directions. Bearing in mind that the experiment took place on a vessel nearing her 10th year of age, the sea water inlet pipe, leading to the FWG, have accumulated already a considerable built-up of limescale on the pipe's inner surface. The HydroPath MARINE unit, through the pulses emitted, affects the latter lime scale on the inner pipe by breaking it off within time. The broken lime scale was driven by the water stream towards the plates and accumulated there. This can be seen on several photos showing a distinct pattern resembling the water flow. The sizes of the broken scale were large

enough as not to flow through. This is a very common phenomenon and it can be said with much confidence that had the experiment continued for another month or two, the remaining lime scale would have been also dissolved by the pulsating effect of the HydroPath MARINE unit and thus would have been washed away with the water stream.

2. Another point to consider is that this particular FWG, is operating for 10 years. As such, the titanium plates, which otherwise have a very smooth surface, so that nothing should have clung to them, were unfortunately damaged over the years by scratches and uneven surface from the previous cleaning processes. The Un-even surfaces of the plates, renders them vulnerable for limescale to cling and accumulate on the plates. When using HydroPath MARINE technology on a new or on undamaged plates, we should not expect to have such an accumulation of scale on the plates.
3. Another, but not less important issue is the difference between treated and untreated limescale. When water is treated with the HydroPath MARINE system, the salts molecules are crystallizing (crystallization process). This crystallization prevents the lime scale from clinging onto the plates and therefore, the lime scale built-up can be easily removed from the surface of the plates as experienced here, unlike untreated lime scale, which requires chemicals and scraping in order to remove it from the plates.
4. Last but not least is the fact that the HydroPath MARINE unit emits pulses that destroy the living organisms in the water. Living organism tend to create not only the slime but are the dominant factor for the scale to cling onto plates to an extent which makes it hard to remove. Dead organisms in that sense do not cling to surfaces and thus, we experienced the easy removal and shake off of the remaining scale, as explained hereinabove.