The new generation of blasting medias

By Per E. Gabrielsson, Corrosion Consultant & Inspector

Far too often ship owners face failures of their newbuildings. Failures, such as coating blisters, coating detachment and premature corrosion are often a direct result of the current accepted means of surface preparation for e.g. erection joints, burns and other damages.

Historically, proper abrasive blasting of these critical and presumably most corrosive areas in water ballast tanks and other join up areas, was not considered practical. With the advent of a new, patented composite sponge-abrasive media, this has now changed and ship owners as well as shipyards can achieve premier surface preparation. New times bring new methods and with the launching of the Sponge-Jet blasting procedure, this problem could rather easily be solved. The time for implementing these new methods is here now. The Sponge-Jet method complies with SOLAS Part A-1, Regulation 3-2, based on IMO Recommendation A 798 of July 1, 1998, stating that ship's ballast tanks areas shall be abrasive blasted.

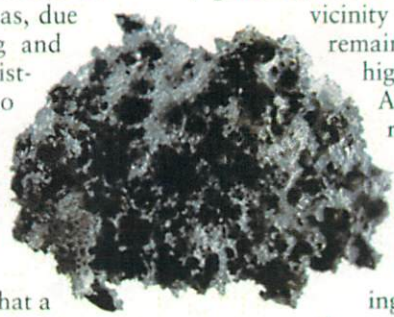
***Sponge-Jet** 35P Recycler (left) and Sponge-Jet 100-HP Feed Unit (right).*

Sponge-Jet – why?

The maritime disasters of the *Erika* and lately the *Prestige* should drive new thinking – not only from ship owner's side, but also from classification societies, paint manufacturers and last, but not least from shipyard's side. There are reports, that ships in a good condition, but where ballast tank coating has been rated less than "good", have been rejected by customers. Whatever could be done now in order to prevent further mishaps, caused by rampant corrosion in water ballast tanks and cargo tanks, as well as in cargo holds of bulk- and combined carriers and to other ecological improvements, should be done.

The Sponge-Jet method is actually not very new. It has been on the market for several years and has, by time, gained more and more supporters amongst various industrial segments.

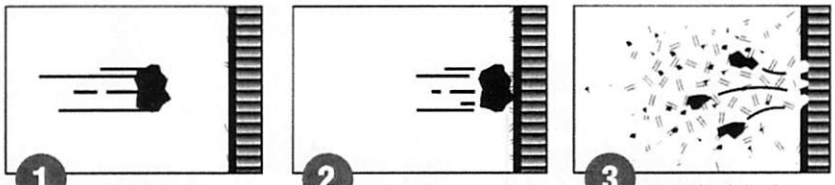
Normally free blasting in ballast tanks has been executed only at block stage, leaving the edge areas of the blocks without preparation and coating, due to forthcoming join up hot works. After the erection welding has been performed, the erection joints have normally been power tooled to a cleanliness degree mostly dictated by the shipyard. Free blasting has rightfully been considered detrimental to the adjacent coated areas, due to abrasive ricocheting and hence damaging the existing coating system. Also the distribution of contaminants throughout the tank space has added to the negative impact to this kind of surface preparation.



As it is well known, that a successful coating system in ballast tanks requires a clean and rugged (rough) surface in order to give optimum protection, it should be obvious that the use of power tool equipment cannot provide such. This was proven in practice on a recent aframax crude oil tanker newbuilding project in Japan, where power tooling to SSPC-SP11, with an anchor pattern of min. 25 micron, had been specified on erection joints and burn damages in water ballast tanks. The yard tried to achieve this by using disc sanders, disc grinders, conical steel- and carborundum grinders, but in vain. The substrate in vicinity of the erection joints remained blackish, due to high current welding. Also the weld joints remained insufficiently cleaned, as the power tools could not reach the valleys of the uneven manual welds. Too heavy power tooling is also said to "burn" the steel surface too much. The anchor pattern was measured to 10–35 micron RZ. The final solution, recommended by the owner's site inspectors, was to use Sponge-Jet, which eventually was accepted by the yard's management – and the results

SPONGE-JET **Comparing Abrasive Blasting Technologies**

Conventional Abrasive Blasting Media

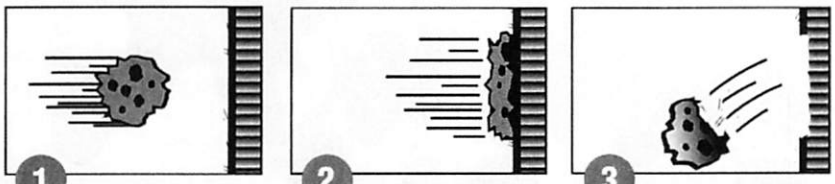


1 **Single-component, conventional abrasives are propelled to the surface using an air-driven system**

2 **Upon impact conventional abrasives...**
- Absorb the high-speed collision by fracturing and ricocheting into the air
- Transfer heat to the substrate
- Strip the complete coating system

3 **Conventional abrasives release all fractured abrasives, contaminants, and coating layers as airborne dust**

Conventional Abrasive Bonded Into Sponge Media



1 **Dual-component, Sponge Media abrasives are propelled to the surface using an air-driven system**

2 **Upon impact Sponge Media abrasives...**
- Absorb collision energy
- Flatten and suppress the release of loosened surface contaminants
- Expose its abrasives with little abrasive fracturing and remove contaminants
- Selectively or completely strip the coating system and profile the substrate

3 **Sponge Media abrasives entrap most of what would normally have become airborne dust**

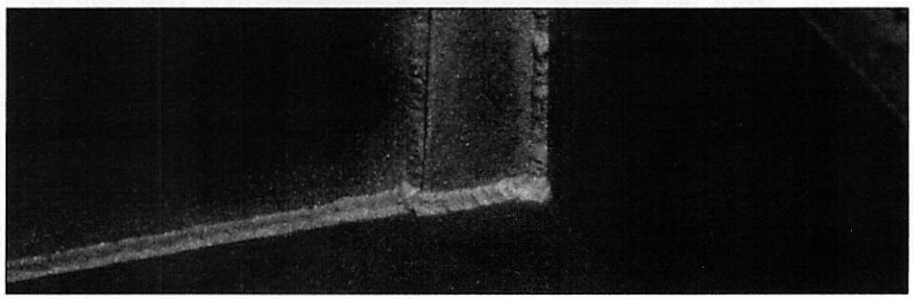
were superior to normal industry practices. The anchor pattern of the Sponge-Jet-blasted areas was measured to 40–75 micron RZ and a blasting degree of SSPC-SP10 (Sa 2∏) was easily achieved.

Sponge-Jet – what?

What is then Sponge-Jet and how does it work?

The innovative Sponge-Jet blasting concept has been created and developed by Sponge-Jet Inc., of Portsmouth, New Hampshire in the United States and contains a blend of completely new thinking in the abrasive blasting field.

The Sponge Blasting System consists of a Sponge-Jet Feed Unit, Sponge-Jet Media Recycler and Sponge Media of different varieties, dependent of the surface to be treated. The Sponge-Jet Blast Units have recently been upgraded to significantly increase production speeds. They consist of a hopper, feed unit, pressure vessel, actuator, auger, control panel, separators and safety devices.



***Sponge-Jet blasted** burn damages – note the smooth overlap (boundary).*

The unit delivers the Sponge Media to the surface in a somewhat different way than normal abrasive blasting pots. There is an actuator inside the blasting pot, which stirs continuously the Sponge-Jet Media, so that it is distributed evenly to the blasting hose and nozzle and prevents clogging and malfunctions of the equipment.

An auger (screw drive) controls the amount of the Media fed into the air stream. The adjustment of blasting pressure and media is provided from a pneumatic control panel. The Sponge-Jet Blast Units are available in a variety of configurations; some include complete vacuum recovery and recycling systems, which were originally built for U.S. Navy shipyards.

The Blast Unit is supplied as a mobile unit, which is provided with a safety frame work in order to protect it from impact damages.

The blasting nozzle is provided with a "dead man's handle" for safety reasons.

The Sponge-Jet Media recycler collects and classifies the used media into three different categories; oversized, reusable and fines. Typically 60–90 per cent of Sponge Media is reusable after each blasting cycle.

The Sponge Media is an open-celled polyurethane particle in which different types of abrasives are embedded. Due to its nature, Sponge Media flattens at impact and exposes the abrasive. After leaving the substrate the Media constricts, pulling and entrapping most of what normally would have become airborne contaminants.

This means that, after contact the media does not ricochet, as normal abrasives, but bounces somewhat back and falls down. This contributes considerably to final cleaning of the object and surroundings. Also the normally observed dust distribution around the blasting area is almost eliminated. The contaminated area may further be minimized by masking off lightly with e.g. plastic coverings. The amount of disposable material is minimized due to the fact that the sponge media is reusable.

In order to meet different demands, a variety of sponge media is available, so

that any needs from customers may be fulfilled – standard Mmedias are:

➤ Red media: For use on heavily corroded steel or heavy coatings/linings. Creates a deep profile. Abrasive: Steel grit. Average recycles: 6.

➤ Silver media: The ideal media for blasting of marine, industrial and commercial objects prior to applying anticorrosive coatings. Fast cutting and creates a rather dense and sharp profile with an anchor pattern of appr. 40–75 micron Rz. Abrasive: Aluminium oxide. Average recycles: 7.

➤ Brown media: For blasting of lightly corroded objects and removal of old, weathered coatings. May also be used for sweep blasting. Abrasive: Dupont Starblast (copper slag). Average recycles: 6.

➤ White Mmedia: Removes coatings from aluminium, fibreglass and other sensitive substrates. Abrasive: Plastic. Average recycles: 8.

➤ Green media: For removal of grease and oil from hard substrates and heavy machinery. Also ideal for removal of soot and smoke from steel and concrete substrates. Abrasive: Very mild. Average recycles: 10.

Sponge-Jet – when?

The risk of over blasting is greatly reduced, due to the near perfect visibility of the surface by the operator while preparing the surface. In addition to erection joints and burn damages in water ballast- and other tank spaces, the Sponge-Jet System may be used for refurbishing of other objects onboard ships, such as small portable and/or integrated tanks and other internal spaces.

In principle, most areas, where free blasting would be condemned, due to its tendencies of creating freely flying dust particles and other pollution, may be treated using the Sponge-Jet System. As previously mentioned, the dust creation from Sponge-Jet blasting is minimal and this may further be reduced by simply erecting plastic sheathings around the area to be treated.

For "delicate" blasting operations Sponge-Jet is absolutely ideal. There is a reported case, in which Sponge-Jet was used for the removal of approximately 2,000 square meters of poorly adhering, newly applied, epoxy coating (3rd coat in a 3 coat system) in water ballast tanks.

The poor adhesion was caused by applying the 3rd coat on a surface, where the steel was at its dew point. A thorough sweep blasting removed the poorly adhering coating, without damaging the sound coatings underneath – only a slight roughening was recorded, which actually was considered a benefit for the forthcoming new 3rd coat.

***Aframax crude oil** tanker newbuilding. Erection joints in water ballast tanks prepared with Sponge-Jet.*

Amongst present users today, it is worthwhile to mention, that also the U.S. Navy has found this method to be useful on several occasions.

Offshore oil platforms have also realized the benefit of this technology, noting significant environmental advantages that include recovery rates (captured and returned to the mainline). To use Sponge-Jet for large projects, where "normal" free blasting could be feasibly performed, may turn out to be too expensive and also too time consuming, as the productivity of Sponge-Jet is not at the same rate.

Here the use of clean Garnet products is strongly recommended, as slag products commonly are not very clean and furthermore have a tendency of leaving inclusions in the blasted surface and are also heavily dusting.

***Sponge-Jet** 400-HP Feed Unit.*

Sponge-Jet – your choice!

As it now has been concluded that the use of the Sponge-Jet system is technically feasible, it is now primarily up to quality orientated owners to decide, whether to implement this radically new way of treatment to e.g. the erection joint/burn damage areas of their forthcoming newbuilding projects. Would the costs involved pay back in the future in improved safety, reduced maintenance costs, higher second hand price, etc.?

The answer is most probably yes! But there are also other aspects which should be considered before ordering a ship – other causes for possible failures, which could be eliminated by improving the building specification already at an early stage. Such are:

➤ The steel preparation grade (ISO/DIS 8501-3.2.) – preferably grades 2 or 3

➤ Residual chloride and sulphate content to be as low as possible (2–3 ug/cm^2). A fresh water washing of the object to be blasted is recommended

➤ The blasting degree of especially water ballast tanks should be at a minimum Sa 2∏ with an anchor pattern of min. 50 micron

➤ Sufficient stripe coating to be performed – also boundary areas to be stripe coated

➤ Do not use paint rollers – stripe coat and touch up with round brushes

➤ Minimum dry film thickness of a ballast tank coating system should be 300 micron

➤ Do not apply single coatings thicker than recommended – the risk of internal stress, cracking of the coating, insufficient curing and solvent retention to be eliminated

➤ Always ensure that the areas to be coated are clean and dry

➤ Climatic conditions to be as per recommendations during application and drying/curing

➤ Confined spaces to be ventilated in order to enhance proper solvent evaportation

➤ Always choose coatings with a reliable track record

***The birth** of an aframax crude oil tanker.*

➤ Aluminium pigmented coatings block ionic transmission more effectively than normally pigmented coatings

➤ Ensure that the used coating is of original formulation and not a "modified newbuilding" coating

➤ Use well motivated, independent coating inspectors for your newbuilding project. The team leader, if more than one inspector, should preferably be an expatriate.

Implementing the above recommendations would also add somewhat to the total investment in a newbuilding, but these are considered to be good long time investments, which, without doubt, will pay back in the future.

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