

Solving rust problems that occur on steel surfaces? Remove the salt!

It is incredibly difficult to prevent rust problems from returning once they have appeared on a steel surface, no matter how hard you try to treat the area with brushing or sand blasting. Whether you get a rust attack on ships or steel structures in seawater, the rust may often come back in the same place shortly after treatment.

A SPECIALIST IN SHIP SURFACE TREATMENT, Norway's Speedy, has seen cases where ships have been sand blasted and coated in the normal manner, but within six months the rust has returned much to the same extent as before the treatment. This is because those treating the steel are not careful enough to measure the amount of salt in the surface of the structure. Washing a ship's sides at low pressure with normal fresh water after sand blasting barely changes the levels of salt. The salt is still present in the steel surface in much the same concentration as before, at 20-25 mg/cm². This is not a very encouraging result. The explanations for why the rust returns so quickly vary from the original paint was much better" to the old rust isn't removed carefully

enough" and "the wrong paint has been used". However, research has shown that the real explanation in most cases is that the salt has not been removed from the steel surface. As a result of sea water exposure and the extensive use of salt on roads and for general removal of ice, today there is a heavy corrosion strain on most steel structures such as ships, platforms, quays, cars, trucks, bridges etc. Salt must be dealt with on maybe as much as 80 per cent of today's steel structures. It is therefore necessary to fight this problem as quickly as possible. In recent years much research has been carried out, along with well documented testing, into how these problems should be dealt with, and many companies have implemented solutions formed from the results.



TECHNICAL REALITIES

- Salt free surfaces do not suffer from under film corrosion.
- Corrosion increases when the steel surface contains salt.
- Electrolytes are required for corrosion reaction.
- Paint systems are permeable.
- Water can diffuse through an undamaged coating system, contrary to electrolytes.

In short, if the salt is not removed from the surface, the rust will soon return.

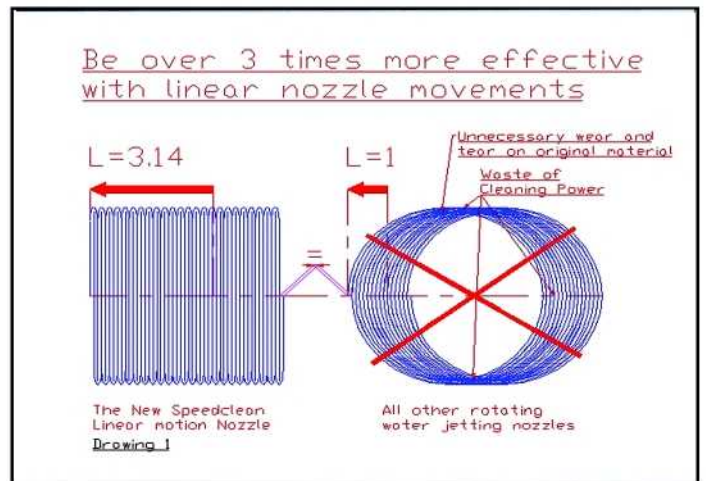
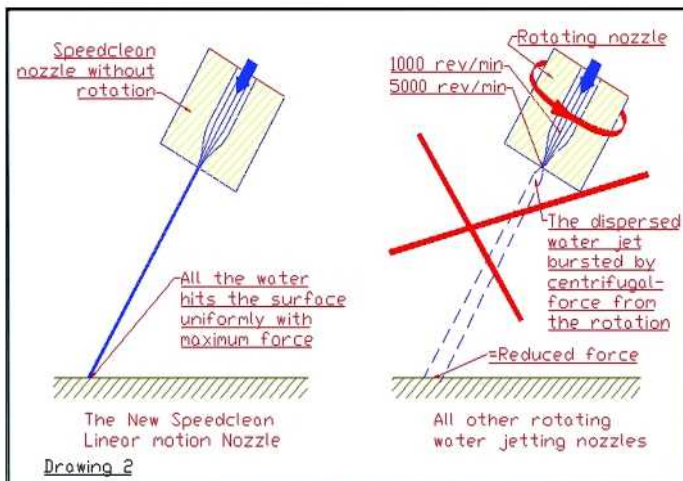
THE DEFINITION OF WATER JETTING

NACE 5/SSPC-SP 122 defines water jetting as a process by which water at a pressure higher than 70 MPa (700 bar; 10 000 psi) is forced through a nozzle for the purpose of cleaning a surface. For water pressures from 70 to 170 MPa (700 to 1700 bar; 10 000 to 25 000 psi) the process is termed "High Pressure Water Jetting" (HP WJ), and for the pressures higher than 170 MPa (1700 bar; 25 000 psi) it is termed "Ultrahigh Pressure Water Jetting" (UHP WJ).

'Hydro jetting', 'aqua jetting', 'hydro blasting', 'aqua blasting' and even 'water blasting' are terms often used synonymously with "water-jetting". Of these, "hydro jetting" and "aqua jetting" are true synonyms giving just as precise a description of the process as "water jetting", whereas the other terms containing the word "blasting" should be avoided because they may be associated with methods using abrasives.

THE SOLUTION

The removal of old paint, rust and salt with water jetting will result in a practically salt free surface. Several paint manufacturers therefore demand



water jetting of the steel surfaces prior to painting if they have to give a guarantee that the repainted areas will remain rust-free. If the steel surface is stripped clean with water jetting the new painted spots will be just as durable as the rest of the surface. It is of great importance to have an efficient, compact water jetting machine that can easily be manoeuvred around the ship to remove rust, salt and old paint in a secure and fast way, in accordance with water jetting standards.

When pitting has started, it is important to empty the pitting pocket of electrolyte and salt remnants to prevent the pitting hole from continuing through the steel, although this is a difficult operation to carry out. Since the pitting holes can be narrow it is hard to reach down into the bottom of the pitting unless using water jetting. The extreme water jet with a speed of up to 680 m/s (2450 km/h) will clean out every trace of electrolyte or rust debris. With water jetting these pitting holes will be clean and ready to be filled up with fresh primer and paint. The holes will be filled completely with paint and the pitting corrosion brought to an end.

NEW FLASH RUST AFTER CLEANING WITH WATER

Any steel surface, except stainless, will show flash rust after being cleaned with water. With time, the flash rust develops from a yellow-brown well adhering light rust, to a red-brown loosely adhering heavy rust. In addition, salt will re-enter the steel surface from the air or from seawater. Therefore it is of great importance to prime and repaint the steel as fast as possible. If hot water is used for water jetting, the heat will be transferred from the water to the steel and the steel plate will dry immediately after cleaning. Oil and grease will also be removed completely and the surface will be ready to repaint. New primer and paint will grip efficiently to the bare steel and give a rigid and firm coating.

ADVANTAGES AND DISADVANTAGES OF WATER JETTING

Water jetting may be used on extremely specific areas, avoiding the unnecessary removal of any original good coating. This is particularly important with surfaces that are damaged over a small area. The paint on the undamaged area may be retained so that overall maintenance is less comprehensive. The cleaned surface becomes practically free from salt, rust and electrolytes, and the newly added paint will last just as well as the original. This also avoids abrasive contamination, such as sand with paint remnants in surrounding equipment. The need for covering and protecting the instruments and equipment will therefore be reduced to a minimum.

In addition, the removal of used, contaminated sand blasting sand disappears. This would be treated as special waste because it is often mixed with old, poisonous paint. The amount will be reduced to only paint and rust which is of small volume and weight - only 1.5 percent of the problem waste that must be taken care of after sandblasting.

There are further advantages to the use of water jetting. Due to the modest amount of water used when water jetting, only freshwater should be used. Water jetting can be carried out in all kinds of weather, and when the surface is dry it can be painted immediately without any risk of particles in the newly painted surface. The steel surface will give excellent grip for new coatings to prevent it from scaling off. It is even better for the health of the painters, as the problem of dust is eliminated with the use of water instead of dry sand and paint dust.

THE PC (PERSONAL CLEANER) ANSWER

The problem with traditional water jetting machines or ultrahigh pressure cleaners is that they are huge, costly and only suitable for cleaning large areas. Speeder was therefore asked by specialists working for shipowners and oil companies if its Speedclean high-pressure cleaners could be adapted to ultrahigh pressure. This is because the company has produced linear motor high-pressure cleaners for 15 years, and thus has comprehensive experience with high-pressure water cleaning. Speeder has thus put its efforts into manufacturing and delivering ultrahigh pressure cleaners that are ideal for removing salt and dealing with rust problems, which have come into existence because of damages in the coating film, before it develops into something serious. Such small machines are very reasonable in price and light in weight compared to the old ultrahigh pressure machines. A Speedclean ultrahigh pressure cleaner has a weight of only 65 kg and a size of only 0.5 x 0.7 m, and is therefore easy to manoeuvre everywhere. In the longer term the company believes that there will be a compact water-jetting machine such as this on every ship and platform and in every maintenance workshop.

SAFETY FIRST

The air motor, which is completely electricity-free, can be used everywhere, even in hazardous areas. To make a machine with maximum safety and durability, this Speedclean ultrahigh pressure cleaner will always be without pressure when not in use. This is achieved with a remote controlled air valve which starts and stops the air motors.

When the valve is closed, the air motors, ultrahigh-pressure hose and pump are completely free from pressure. The Speedclean ultrahigh pressure cleaners therefore are not equipped with expensive ultrahigh pressure closing water valves. So all seals, hoses and other components develop little wear and tear.

The ultrahigh pressure cleaners are also manufactured in accordance with a "fail-safe" solution, so that even if the ultrahigh pressure hose should burst, against all odds and adequate safety factors, it is physically impossible for the water to reach any persons or equipment.

NEW, MORE EFFICIENT WATER JET MOVEMENT

When carrying out ultrahigh pressure cleaning, nozzles must be applied with motion; if a motionless nozzle were used, it would be like colouring a piece of paper with a ballpoint pen. It would be difficult and demanding work to get an adequate and even surface treatment. Until now the standard solution has been to use a rotating nozzle. But Speeder has developed a new linear solution, where the nozzle is moved back and forth by means of a small air driven linear motor. This is a very simple, reliable and reasonably priced solution, which gives efficient treatment right from the start. Furthermore, the jet can be inclined with a certain optimised angle on the surface, which strips the surface of rust and old coating much more efficiently. The Speedclean jet constantly works in the most efficient way because it reduces the wasted time and energy incurred with a rotating nozzle. Figure 1 in this article shows the difference between using a Speedclean linear moving nozzle and all other types of normal rotating nozzles in use today. Notice that the illustrated jets show the same thickness for both nozzles.

OVER THREE TIMES MORE EFFECTIVE

From the illustration accompanying this article you can see that an ultrahigh pressure cleaner with a three litre per minute capacity and Speeder linear nozzle solution has a working capacity equivalent to all the others with more than 9 l/min and rotating nozzle.

Speeder predicts that this will revolutionize the use of ultrahigh pressure cleaning, marginalising other techniques such as sand blasting. When efficiency increases by more than 300 per cent in comparison with other techniques, the investment costs are minimal and the running costs are heavily reduced. Then the use of ultrahigh pressure cleaning will really take off and oust other older techniques. Speeder says that it has seen a gradual increase in interest in this new water-jetting machine as the industry has become more familiar with it.