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Shot Peening Applications for Two Purposes

Djozic´ Salko, B. Sc., Senior Mechanical Engineer, Croatia

Engineers are always looking for ways to improve their products. The process of shot peening is one method of improving an article's resistance to corrosion and fatigue. Below are two potential shot peening applications which as yet have not been researched. Each have a unique set of circumstances guiding their choice of shot peening as a potential solution to the Engineer's dilemma "How to improve my product."

Underwater Shot Peening

Today we are witness to much progress in the construction of floating platforms for sea bottom exploration and drilling to extract the crude oil which has become so necessary to our civilization for life. Of course, much is already documented on the technology of underwater welding on ships and submarines. It is evident that such processing underwater is more costly than if done out of water in a shipyard. After welding it is often necessary to treat the weld joint for the purpose of decreasing or eliminating residual stresses.

It is natural to question if there would exist a possibility to do shot peening underwater. Some portions of the metallic structures on the shells of platforms, ships and submarines will already be under the water before requiring shot peening. The underwater peening method would not be recommended over other methods in many cases. However, in those cases where the effects of shot peening are necessary to satisfy a calculated and determined goal and access to the subject area is not possible out of water, underwater peening could be used to increase the surface hardness of the metal and for some period of time avoid any initial cracking or cracking caused by corrosion.

Any dust generated during the process of underwater peening would be dissipated into the water and should not disturb the operator. It may be necessary to use compressed air to produce additional streaming in the water mass around the operator to help dissipate any particulates in the water. Under normal conditions, the impact of shot on metallic surfaces produces some surface heating, it is not believed that this heating effect would be great enough to create steam underwater, making visibility and working conditions difficult for the operator.

Maybe some people will say that underwater peening is useless and impossible or maybe that it is only a fantasy of someone dreaming of the future. After all, it is necessary yet to invent a new device or machine for shot peening underwater that would be easy to operate and manipulate by hand before this could become a reality. The outfitting of the operator with the proper dress and protection, perhaps in similar attire to those of a diver, must also be investigated. Perhaps only a short time will pass before a new technology, shot peening underwater, will appear.

Items in Powerhouses

Power generating stations on the rivers have many watergates as barriers for the water. Many of them have very different shapes, in accordance with their placement and function. As an example, plan shape watergates have the function of keeping the water behind the dam. The lifting and lowering of these gates is accomplished by a designed steel structure of guides. Along these guides, a series of rolls/wheels attached to the gates go up and down. These guides, as well as other faces are embedded in concrete with steel anchorages. Their position on the dam must provide easy movement of the gate in the desired direction.

Smoothness and flatness of the metallic surface must be assured. They must be able to tolerate/absorb some impact shocks from the gates without damage. The peening of these embedded guide surfaces would impart compressive stresses in the surface layers of the guide faces along which the guide rollers travel.

The components of these vertical or sloping gate/guide systems on the dams are divided into two categories. The portions of the gate/guide system which are always underwater are classified as an active surface. Depending on the size of the gate, the design engineer will often require the surface be coated/covered with stainless steel as an appliance against corrosion.

The bottom part of the guide which is welded to the two vertical portions is called the threshold or seal beam and is always in the water. This horizontal portion is usually covered or welded with stainless steel. It is necessary to know that this active surface is smooth and flat so as to gasket with the gate portion of the system and provide water tightness of the dam. As the gate is lifted from its sealed position, a very delicate streaming of water occurs. During this operation, at certain water velocities, cavitation of the water stream occurs. It is also necessary to keep in mind that along with the water which flows over this seal beam at high velocities there are also such dirties as sand and other items that can cause undesired effects.

The portions of the gate/guide system which are normally always out of the water are called the passive portion. These surfaces are not usually covered with stainless steel, for them normal painting practices are enough to provide for treatment/protection against corrosion.

Corrosion and cavitation are two reasons to introduce the process of shot peening, with its metallurgical benefits and surface finishing abilities, during the construction of these gates.

The medicine for solving the illness of this construction could be shot peening. That is to say, shot peening could provide beneficial treatments against the corrosion and cavitation that are a part of the design and usage of these dams.

The exact technology (parameters/techniques) for shot peening will need to be prepared/developed before the active surfaces of the gate/guide system can be protected against all these undesired phenomenon and appearances. ❍