

Heat Exchangers Descaling, Cleaning and MMM technology

Short resume

Ultrasonic preventive, real-time maintenance, descaling and cleaning of pipelines and heat exchangers (in-line) is already known and used in industry (it exists large published and other technical information and it will be added to this resume). What is typical for present, known methods of ultrasonic heat exchangers cleaning and/or descaling is:

1. This is single ultrasonic frequency operating regime.
2. Ultrasonic transducers are directly fixed/screwed/welded to heat exchangers reservoirs, flanges, pipelines and this is known to operate well (lot of published and supporting material will be presented,... some of it is still confidential).

MMM heat exchangers ultrasonic cleaning is more efficient and different from presently known (fixed frequency) cleaning in the following:

1. MMM (**M**ulti-frequency, **M**odulated, **M**ultimode) means that ultrasonic transducers are driven with multi-frequency, wideband power supplies, and this kind of masses agitation is known as much more efficient regarding cleaning effects, ultrasonic field penetration, homogeneity of ultrasonic activity etc. See the MPI patent application and explanation of MMM technology.
2. MMM ultrasonic agitation can be applied directly by external fixation of ultrasonic transducers to heat exchangers tanks (like others are doing with single frequency transducers), but it can also be applied remotely, somewhere on an inlet fluid pipeline, far from a heat exchanger tank. MMM ultrasonic agitation is temporarily modifying water (or working fluid) properties and creating fluid charged with cavitating and vibrating activity, which has relatively long life (maybe 100 seconds, or much more) and can be transported (on a relatively long distance) by a water flow. When such activated water enters heat exchanger tank, it is still performing ultrasonic cleaning and descaling around. This second method is something original (somewhat similar to known single frequency methods, but much more efficient, faster and penetrating longer). There are publications supporting existence of long living ultrasonic activity, but MMM ultrasonic agitation is maximizing such effects (Existing supporting documents will be added to this resume).
3. In addition, we can also use submersible MMM ultrasonic transducers and place them internally in a heat exchanger tank or inside inlet pipeline realizing similar or better effects of preventive descaling and cleaning. MPI has such transducers. Of course, we can also process already degraded heat exchangers with significant scaling layers, but processing time will be much longer.

I have technical statements or reports from different clients, producers and users (some of them in Nuclear Power Industry, or water supply factories, or heat exchangers business ... and some of them are still confidential). Circumstantial technical evidence is really voluminous (will be presented). We should not forget that here we are addressing relatively new trends and innovations in pipelines and heat exchangers descaling and cleaning, but similar technologies are already known (and available from some sources), as very efficient, based on much simpler ultrasonic technology... Systematic R&D efforts should be invested to quantify and parametrize all of that regarding processing volume, applied liquids, distances etc., but this will take a time, and based on what we already have, we can already now develop big confidence in such projects. We need to reserve and secure our place in this field of applications, before others realize how to address similar problems. Of course, there are many still not completely answered questions... (Here I am directing our attention to an open window in a new world of extraordinary applications, but this will also be sufficiently well documented; -just it takes a time). Our advantage is MMM driving of ultrasonic transducers (fast, efficient and long range), and we can apply transducers directly, externally, like others, as Clamp-On mounting (only MPI method), and as submersible transducers (MPI method).

We can find lots of published information about ultrasonic descaling and heat exchangers... MMM structural agitation and descaling is working on a similar way, but much more efficiently and faster...

MMM agitation is in the same time good for stress relief (without applying manual peening). Of course, manual peening is very efficient and excellent for stress relief, but it is taking lot of time... and it is not elegant and comfortable as MMM structural agitation. MPI peening is very robust, and much more efficient than similar equipment from competitors...

Combination between alternating magnetic field and MMM or peening agitation will certainly produce better and faster stress relief and boiler, pipelines and heat exchangers descaling, and this is giving us a chance to make patents (since we will introduce innovative elements)... everything else regarding peening is already patented or published...

The advantage in our MMM case of applications is that we can use almost the same MMM equipment for heat exchangers preventive maintenance, descaling and continuous in-line cleaning, and for stress relief... (we only need to apply different settings on ultrasonic generator software).

According to published and experimental work information and experiences I collected, also alternating magnetic field applied on pipelines and heat exchangers is effective both for descaling and stress relief (because magnetic field is producing mechanical vibrations in ferromagnetic bodies), meaning that we can be technologically very strong with our proposals...

Applying multiple MMM agitators and enough ultrasonic power, 90% or more of the big ship's hull or even a complete drilling rig can be destressed, on a very clean, quiet, fast and elegant MMM way (instead of peening every weld and joint), and only minor ship areas can be additionally manually treated with the pinning tool... just for increased security. We can also make complementary combinations with alternating electromagnetic destressing... just to increase stress relief efficiency in zones with difficult access.

Presently available IP in close relation to here-applied MMM technology is:

DISPOSITIF POUR LA GENERATION D'ONDES ULTRASONORES

Inventeurs : Prokic Miodrag et Jean Claude Padoy

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European Patent Application: EP 1 060 798 A1

Unidirectional single piston ultrasonic transducer

Applicant: Prokic Miodrag, MP Interconsulting, 8.06.1999 – 20.12.2000

European Patent Application (related to MMM technology):

EP 1 238 715 A1

Multifrequency ultrasonic structural actuator

Applicant: Prokic Miodrag, MP Interconsulting, 5.03.2001 – 11.09.2002

More about design and implementation options:

Here we have two or three methods and design options (both for real-time cleaning and descaling of very much polluted heat exchangers, and much more appropriate is to promote our technology as preventive, continual maintenance without stopping the process... meaning, such technology is applicable to relatively new and clean installations). Below I will give explanations about specific technological elements and differences between different options for real-time heat exchangers maintenance:

- A) First and most generally applicable heat exchangers and big reservoirs treatment is MMM ultrasonic technology, already explained for stress relief applications. In the same time when we make stress relief (as you can see in my PowerPoint presentation), we can also remove scaling, pollution, oxides, corrosion and mineral and ceramic layers from internal walls and elements of big and small heat exchangers, nuclear reactors... if we rigidly fix MMM ultrasonic transducers (externally) to heat exchangers. We only need to make proper MMM ultrasonic generator settings and programming, and we will have permanent, real time, preventive cleaning... Generic patents valid for such applications are already mentioned before (the same as for MMM stress relief)... We only have different MMM ultrasonic generator programming (meaning software manipulation). We can also create new patents, since I can produce all relevant claims. This is also very big business bite. Think about... should be appropriately addressed (inestimable business potential if well managed).
- B) Second technological option for heat exchangers preventive maintenance is remote ultrasonic cleaning based on water (or working fluid) ultrasonic activation (by creating long living cavitating states). This presentation I already gave you in the document where is explained what we could patent (see "Pipelines cleaning project"). The same equipment is applicable for oil wells and long pipelines cleaning (differently installed and applied), and here mentioned preventive maintenance and cleaning of heat exchangers. Here we can make simpler version of ultrasonic water activators, and also much more sophisticated and complex water or liquid activators for very long distance cleaning... Acoustically active water or fluid will enter heat exchanger and realize cleaning and descaling. Again, here relevant questions are how we will organize all of that and maximize business results... Think about it. It is not simple, direct, and fast and over-night activity... but we can control everything mentioned.
- C) Third design option is to introduce ultrasonic sonicators directly inside big heat exchanger, somewhere closer to the inlet section where water is not very hot. I have necessary sonicators... again my sonicators have elements of MMM ultrasonic technology and we can be better than any competitor.