

# MP- Interconsulting Ultrasound Technology

## Ultrasonic based Preventative Cleaning of Oil and Gas Pipelines and other associated assets

### Executive

MP-Interconsulting has developed over 25 years of know-how and expertise in the field of Ultrasonics. The innovation of “MPI” products is based on the proprietary MMM (Multifrequency Multimode Modulated) sonic and ultrasonic created vibrations which are unique to MPI. Such sonic and ultrasonic driving creates uniform and homogenous distribution of acoustical activity on a surface and inside a vibrating system, while avoiding creation of today’s standard stationary and standing waves, so that the whole vibrating system is fully agitated. Such ultrasonic structural excitation is ideal for agitating liquid and solid masses for long distances while maintaining optimum efficiency of electrical to acoustic energy transfer.

### Today’s State of the Art Technology

In traditional ultrasonic technology, transducers have been designed to satisfy precise resonant conditions: In order to achieve maximal efficiency, all oscillating elements should operate on the same frequency. All traditional sonic and ultrasonic actuators or transducers oscillate in a type of simple or mixed, constant-frequency contraction-extension vibration mode. Depth and amplitude of traditional excitation is relatively low when compared to the MMM method and for this reason the corresponding complexity, efficiency and speed of cleaning service is much lower (up to factor 4).

### The Unique MMM Technology

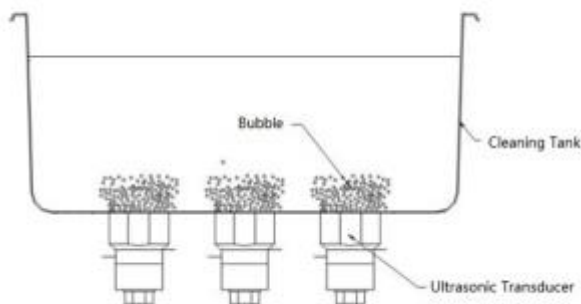
The MASTERSONIC program represents a brand new approach in Sonic and Ultrasonic power supplies and equipment.

The MASTERSONIC power supply equipment is based on the described MMM Technology. It produces a unique high efficiency active power as wide-band sonic and ultrasonic vibrations. Wide-band sonic and ultrasonic energy (ranging in frequency from infrasonic up to the MHz domain) propagates through arbitrary shaped solid structures such as pipes, heavy and very-thick-walls metal containers, pressurized reservoirs, very thick metal walls of autoclaves, etc. The secret to its application is a novel sonic / ultrasonic, multi-frequency power supply (MMM Technology) that can initiate ringing and relaxing, modulated, multimode mechanical oscillations including harmonics and sub-harmonics. The system offers fine control and excellent repeatability from its programmable interface and produces high efficiency active power ranging from below 100 W up to several kW.

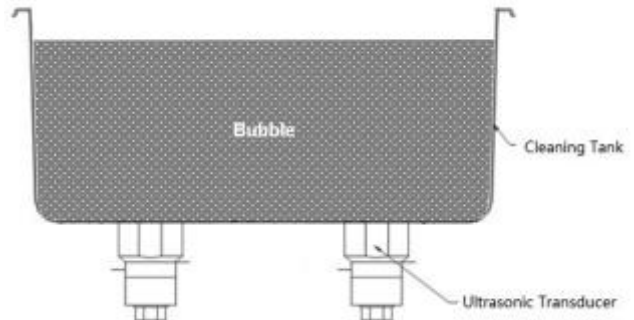
Multi-frequency, Multimode, Modulated Sonic & Ultrasonic Vibrations (MMM Technology) can be excited in any heavy-duty conditions, producing pulse-repetitive, phase, frequency and amplitude-modulated bulk-wave-excitation covering and sweeping an extremely wide frequency band. Such sonic and ultrasonic driving creates a unique, uniform and homogenous distribution of acoustical activity on a surface and inside of the vibrating system, while avoiding the creation of stationary and standing waves, so that the whole vibrating system is fully agitated. Such multi-frequency ultrasonic structural excitation is ideal for agitating arbitrary shaped liquid and solid masses at arbitrary distances and placed on pipes/pipelines, at any temperature, while maintaining optimum efficiency of electrical to acoustic energy transfer.

To visualize the highly improved micro-bubble distribution in a typical ultrasonic bath:

Standard Ultrasonic microbubble distribution



MMM Ultrasonic microbubble distribution



**Example Comparison:** Heat Exchanger with MMM preventative cleaning and without after 1 year operation



**WITHOUT MMM**



**WITH MMM**

**Oil & Gas Pipeline “MMM based Preventative Cleaning Principle”**

The unique ultrasound is generated and applied onto the external wall of the pipeline and is transferred through the wall thickness and along a substantial length of the pipeline asset. Ultrasonic actuators can be fixed via Clamps, Welding or can be screwed either directly onto the pipe wall or onto flanges. If the MMM system is applied to a facility with existing fouling of the inner pipe surface then depending on the type and thickness of the scale then a sequence of operation will allow for removal of this layer over a period extending from weeks to several months. Each situation will vary depending on many factors such as pipe diameter, wall thickness, free standing segments, scale makeup, operating conditions etc. Once a specific facility has been specified for an MMM preventative cleaning system then parameters can be fixed and set for continuous and automated operation.

It is highly recommended that MMM preventative cleaning systems be accounted for and facilitated for within “New Build” phase so as to mitigate any and all solids build-up within the system. This will lead to:

1. Lower transmission energy (costs)
2. Fewer shutdowns and slowdowns
3. Fewer cleaning runs
4. Reduction in chemical cleaning usage
5. Overall lower environmental impact
6. Increased overall plant safety

The overall MMM based process creates ultrasonic waves causing the following two principle effects:

1. Cavitation

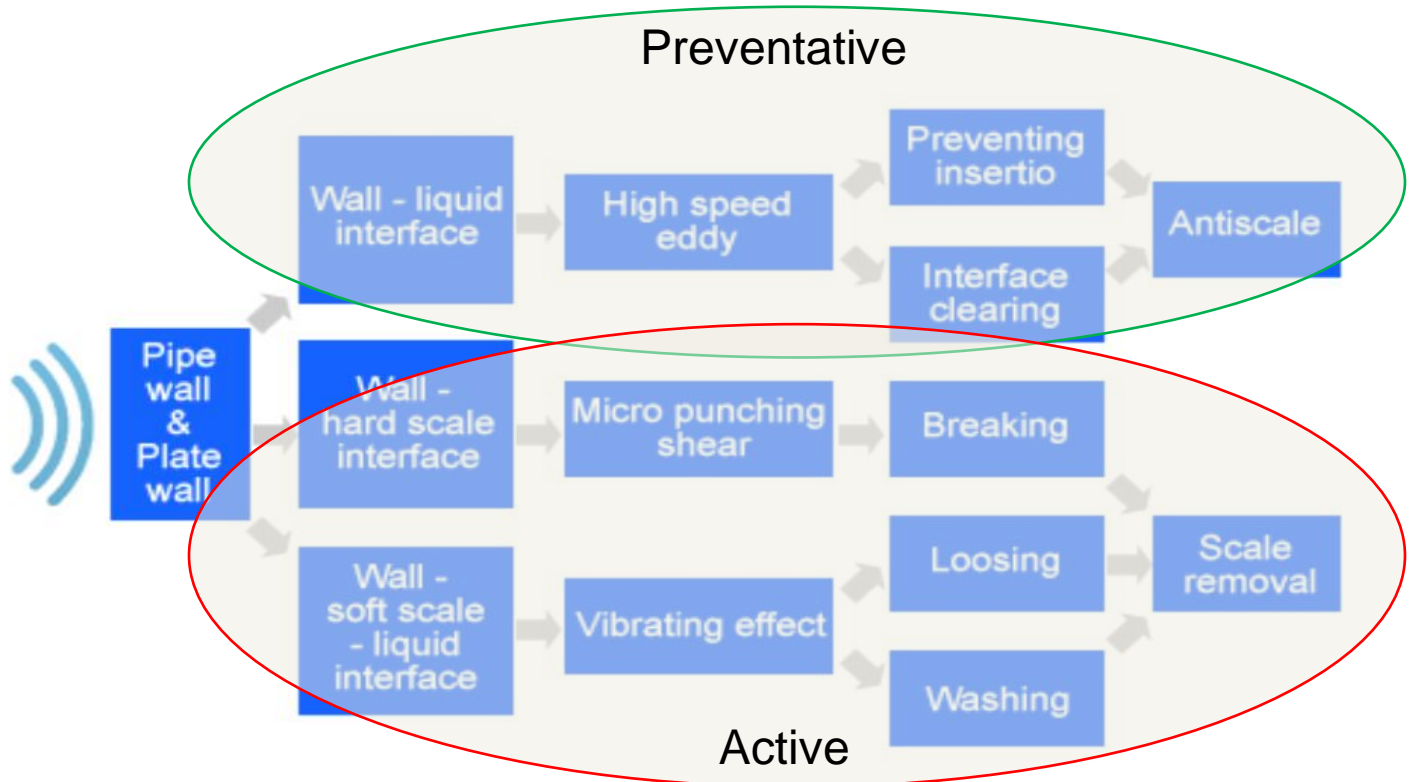
The Ultrasonic waves repeatedly induce the formation and collapse of micro-bubbles. Each collapse of these micro-bubbles are under extreme pressure and temperature conditions (up to 1,000 bar and 5,000 deg C) The energy generated prevents particles and gases from bonding to the interior metal surface, thereby keeping the surface free of any depositions which may impede or reduce flow (or increased pumping) and associated downstream complications. The energy produced also shatters and breaks down any free floating particles.



## 2. Vibration

The micro vibrations which are generated then transferred to the whole pipeline facility through metal, preventing newly formed scales sticking onto the pipelines inner diameter. When ultrasonic wave travels through pipe wall a shock wave occurs and generates high speed eddy's in the liquid, which prevent the scale formation. Additionally shear stress can be formed between any scale and the metal wall. This will change the properties of the scale, and finally make it disperse, disintegrate and fall off.

The overall processes of Preventative Cleaning and Active Cleaning:



### Some typical projects to date

2013	Russia	Power Plant	Gas Pipeline	MMM Flange
2015	Canada	Oil Platform	Oil Transfer Lines	MMM welded
2016	USA	Power Plant	Heat Exchanger	MMM In-Liquid

### Investment Opportunity

License: Regional license

Acquisition: Technology, IP

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