

Technology Offer	
Reference	CH-CRI-TO68
Time of arrival	21.1.2004
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Title	New ultrasonic generator technology for homogeneous ultrasonically assisted Metal Casting, Mixing, and Forming
Sender country	Switzerland
Technology	Automation and measurement, Mining and foundry,

Title

New TO - **New ultrasonic generator technology for homogeneous ultrasonically assisted Metal Casting, Mixing, and Forming**

Reference

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Abstract

A small Swiss company has developed a new technology that applies high power ultrasonic energy to large, heavy irregular mass or un-tuned mechanical systems such as extruder, drawing die, mould tools, metal melt mixer, continuous casting, homogenizing, degassing, alloying, very fine and homogenous micro-crystallization, sintering, etc. The company looks for industrial partners interested in application development and in research institutes and companies for testing of new applications.

Description

Conventional power ultrasonic systems comprising the power supply generator and piezo-electric transducers, as used in ultrasonic cleaning and welding applications, are limited in function and adaptability to new metal working applications. A new ultrasonic generator technology has been developed to allow the use of conventional high amplitude transducers to drive large irregular shapes and un-tuned mechanical systems such as extruder heads, drawing die, injection mould tools, or a metal melt mixer. This new technology has the unique capability to stimulate wide-band sonic and ultrasonic energy (ranging from infrasonic up to the MHz domain). The key to the technology is its use of advanced Digital Signal Processing techniques to analyze feedback signals and create custom driving wave forms to initiate and control ringing and relaxing, modulated, multimode mechanical oscillations in the harmonics and sub-harmonics of the attached mechanical system. Such ultrasonic driving creates uniform and homogenous distribution of acoustical activity on the 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.

The idea of applying ultrasonic energy to metal working (e.g. mixing, alloying, continuous casting, drawing, forming, homogenizing, degassing, very fine and homogenous micro-crystallization, sintering, molding) applications is not new and has been subject to some research. While many advantages have been found and published, the ability to implement such systems in production environments has been restricted due to limitations of conventional ultrasonic technology. The proposed new solution is a breakthrough in this regard and allows the industry to revisit a number of interesting applications that have been previously conceived and abandoned. Ultrasonics may be used to reduce friction between tools and the material under work, will improve metal homogenizing and allow mixing of new alloys previously difficult to make. Ultrasonics has also been shown to improve some metal characteristics such as hardening, stress relief, and crystallization during casting. In addition to offering improved product quality ultrasonics is often speeding the process by a significant factor. The company offering this new technology has extensive expertise in all aspects of design and development of ultrasonic equipment and the application to industrial systems. The company is not experienced in metal working technology or processes and seeks partners who offer such expertise and application development resources.

Innovative Aspects:

- Development of a new ultrasonic electronics and a system feedback concept that allows real-time adaptation to continuously evolving acoustic conditions.
- Capability to ultrasonically drive any arbitrary shape or large mechanical system at high energy if needed
- Ultrasonic driving of system harmonics and sub-harmonics gives a wideband multi-frequency effect that improves stimulation of the system.
- Elimination of ultrasonic standing waves gives uniform treatment of materials.

Main Advantages:

- Improved metal homogenization and mixing of new alloys.
- Improved crystallization and alloy characteristics in casting.
- Friction reduction between a tool (e.g. casting, drawing, extruding, molding) and the material being worked improves the material flow.
- Improved Surface finish on extruded or drawn materials.
- Reduce or eliminate material voids or cavities in casting or molding applications.
- Power Supply Generators are available in a standard range of 300 watts to 2,000 watts. Custom systems available to 120,000 watts.

Technology Keywords

 Forming (rolling, forging, pressing, drawing) ; Hardening, heat treatment ; Molding, injection molding, extrusion, sintering ; Iron and Steel, Steelworks ; Metals and Alloys ; Non-ferrous Metals

Current Stage of Development

 Already on the market

Intellectual Property Rights

 Patent(s) granted

IPR Comments:

Patented : EP1238715

and secret know-how

Exploitation of RTD Results

PRIVATE RESEARCH

Brief Market Application Codes

Aerospace technology ; Heavy metals industry, smelting ; Industrial manufacture ;
Materials technology

Detailed Market Application Codes (VEIC)

MA Keywords:

Homogeneous injections/extrusions ; Non-homogeneous injections/extrusions ;
Speciality metals (including processes for working with metals) ; Machine tools, other
metal working equipment (excluding numeric control)

MA Highlights:

- Metal profile and tube extrusion
- Wire drawing
- Die casting and Injection molding
- Metal mixing, homogenizing, degassing, alloying, very fine and homogenous micro-crystallization
- Continuous casting
- Sintering

Collaboration Type

Technical Co-operation ; Joint venture agreement ; Commercial Agreement with
Technical Assistance

Comments:

- Type of partner sought : Industrial companies and research institutes.
- Specific area of activity of the partner : Manufacturer of ferrous and non-ferrous metal alloys, Aluminum casting, degassing, improving micro-crystallization, alloying, extrusion, wire drawing, metal injection molding.
- Task to be performed: New process research and development, adaptation and installation of ultrasonic equipment to existing and new processes.