



Advanced Surface Alloying for Improved Performance of Iron & Steel Castings OTT 1585

Applications:

Industries that rely on steel components exposed to wear or corrosion—including water and wastewater treatment, chemical processing, oil and gas, and power generation—could benefit from this surface alloying method.

Target Problem:

Steel components are widely used in the water and wastewater industry, including valves, fittings, flanges, and pump castings made from plain carbon steels. These components operate in harsh environments and often experience corrosion and wear, leading to premature failure, water loss, and increased maintenance costs. Similar degradation affects plain carbon steels used in many other industrial applications, where corrosion, oxidation, and wear limit component lifespan and performance.

Technology/Solution:

While alloying an entire steel component can improve corrosion resistance, it significantly increases material and production costs. Surface coatings are sometimes used as a lower-cost alternative, but they often suffer from limited durability, challenges in application to large or complex geometries, and the potential release of harmful chemicals into water.

This in-situ surface alloying method addresses these limitations by providing a durable, cost-effective surface enhancement without the drawbacks of conventional coating technologies.

This technology improves the surface properties of steel components directly during the casting process through an in-situ surface alloying approach. Metal alloy powders, applied as a slurry, are introduced to the surface of mild steel—or other ferrous alloys—during sand casting, producing a modified surface layer with enhanced performance. The process is completed in a single step and has been validated through both laboratory studies and full-scale industrial trials, providing a durable and cost-effective alternative to conventional alloying and coating methods.

Key Benefits:

- **Low cost** – low-cost approach leading to enhanced surface properties
- **Versatile** – no size or shape limitations
- **Single- step process** – single-step surface modification achieved during casting process itself
- **Precise** – thickness control in the range of 200-400 microns

Partnering Opportunity:

We seek partners in casting, water and wastewater treatment, chemical processing, oil and gas, and power generation to advance this technology toward commercialization.

Intellectual Property (IP):

U.S. Patent [US12420332B2](#)

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