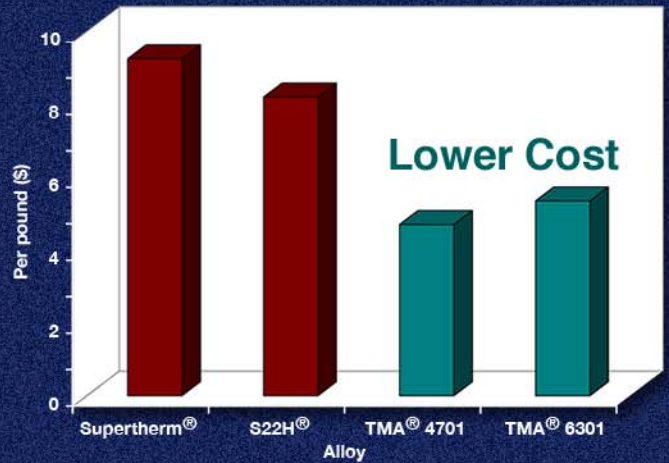
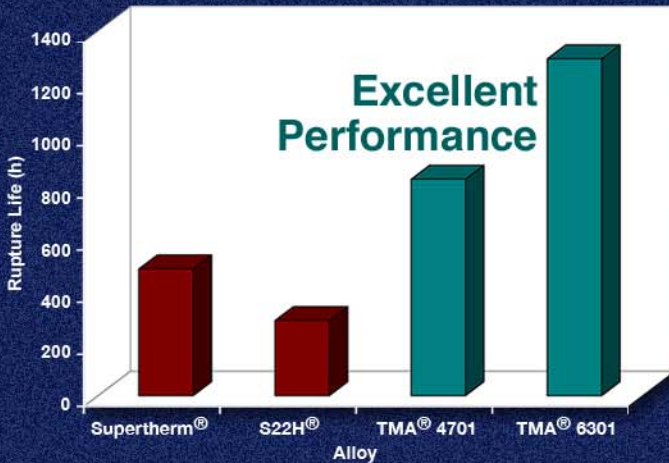


## TMA<sup>®</sup> 6301 and TMA<sup>®</sup> 4701: New Heat-Resistant Alloys





## ITP Materials Project Wins R&D 100 Award

### New Heat-Resistant Alloys Offer Increased Performance at Lower Cost

#### Background

- Heat-resistant alloys that are commonly used for process equipment are limited by service life and creep rupture strength.

#### The Project

- The microstructures of various existing alloys were characterized, and multi-phase computational models were used to correlate predicted microstructure with known material properties and performance.
- New, improved HP and HK grade alloys were developed via computer-aided design.

#### Results.

- TMA® 6301, an HP grade alloy, has three times the life of standard alloys at the same cost, and 2.5-4.5 times longer life at 60-70% of the cost of specialty alloys.
- TMA® 4701 an HK grade alloy, has about twice the life of standard alloys at the same cost, and about 1.7-3.0 times longer life at about half the cost of specialty alloys.
- The new alloys extend operating temperatures by 50°C.
- These improvements were achieved without the loss of castability or weldability.

#### Highlights

- Computer-aided alloy design has reduced the development time for new alloys from 6 to 10 years to about 3 years.
- Two patent applications for separate series of alloys were made in 2005.
- Nucor has installed radiant tube assemblies from TMA® 6301 for galvanizing line furnaces in two plants, and Timken has installed radiant tube assemblies from TMA® 4701 for heat treating furnaces in two plants.
- Preliminary estimates show that the new alloys will save as much as 15 trillion Btu/year and over \$60 million/year in the chemical, steel, and heat-treating industries.

#### Developers:

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