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SOUTHWEST STEEL PROCESSING LLC



FORGED VS CAST MINING TEETH

Enhancing Mining Efficiency:
The Superiority of Forged Mining Teeth
over Casted Alternatives

INTRODUCTION

FORGED VS CAST MINING TEETH

Mining Teeth (aka “Claw Teeth”) are essential components in various heavy-duty machinery and equipment, notably in industries like mining, construction, and agriculture. The choice between forged and cast claw teeth significantly impacts the performance, durability, and overall efficiency of these machines.

This white paper delves into the advantages of using forged claw teeth versus cast claw teeth, highlighting the superior qualities of forgings in terms of strength, reliability, and cost effectiveness.

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The Crucial Role of Mining Teeth in Mining Operations

Claw teeth serve as crucial components in a wide array of heavy machinery, including excavators, loaders, bulldozers, and agricultural implements. These teeth are subjected to extreme conditions, such as abrasive materials, high impact forces, and repetitive stress. Thus, the selection of claw teeth material and manufacturing method is critical to ensure optimal performance and longevity of the equipment.

Mining teeth, also known as bucket teeth or excavator teeth, are specialized components primarily used in mining operations for digging, excavating, and loading materials such as ore, coal, and minerals into haul trucks or processing equipment. However, these teeth can also find applications in the construction industry due to their durability, versatility, and efficiency.



**MAXIMIZE
DURABILITY
VERSATILITY
EFFICIENCY**

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How Mining Teeth are Utilized in the Construction Industry

Here's how mining teeth are utilized in the construction sector:

- 1. Rock Breaking and Demolition:** In construction projects requiring rock breaking, demolition, or concrete removal, mining teeth with reinforced tips and cutting edges are indispensable. These teeth can effectively fracture, break, and disintegrate hard materials, such as concrete, asphalt, and rock, allowing for safe and efficient demolition activities.
- 2. Site Preparation:** Prior to commencing construction activities, site preparation is essential to clear vegetation, level the ground, and remove obstacles. Mining teeth mounted on heavy machinery play a vital role in land clearing, site grading, and preparing the terrain for subsequent construction phases, ensuring a stable foundation for buildings, roads, and infrastructure.
- 3. Road Construction and Maintenance:** Mining teeth are utilized in road construction projects for excavating trenches, shaping embankments, and laying underground utilities. Additionally, these teeth are instrumental in maintaining roadways by repairing potholes, removing debris, and resurfacing damaged asphalt or concrete surfaces.
- 4. Pipeline Installation:** The installation of underground pipelines for water, gas, or sewer systems requires precise excavation and trenching operations. Mining teeth equipped on specialized excavator attachments enable contractors to dig trenches with the required depth, width, and alignment, facilitating the installation of pipelines in urban and rural settings.
- 5. Landscaping and Environmental Remediation:** Mining teeth can be employed in landscaping projects to sculpt terrain, create ponds, and construct retaining walls. Moreover, in environmental remediation efforts, such as soil stabilization, erosion control, and wetland restoration, mining teeth aid in reshaping landscapes and implementing sustainable land management practices.

In summary, mining teeth play a multifaceted role in the construction industry, contributing to various aspects of site preparation, excavation, material handling, demolition, and infrastructure development. Their robust design, cutting-edge technology, and adaptability make them indispensable tools for contractors and construction professionals seeking to enhance productivity, efficiency, and safety on construction sites.



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MINING TEETH WEAR OUT AND CAUSE COSTLY DELAYS

Mining teeth, being crucial components of heavy machinery used in demanding environments, are subject to significant wear and tear during operation. Several factors contribute to the wear and eventual need for replacement of mining teeth including:

**Abrasive Materials - Impact and Shock Loading - Heavy Loads - Corrosion
Design - Heat and Friction - Maintenance - Operator Skill**


As mining teeth wear out due to these factors, their cutting efficiency, penetration capabilities, and overall performance diminish. When the wear reaches a critical point where the teeth no longer meet the required performance standards or pose safety risks, they need to be replaced. Regular inspection, monitoring of wear patterns, and proactive maintenance practices are essential to identify worn teeth and schedule timely replacements to ensure optimal equipment performance and productivity in mining and construction operations.

THE IMPORTANCE OF DURABILITY AND STRENGTH

The importance of durability and strength in mining teeth cannot be overstated, as these characteristics directly impact performance, productivity, and operating costs. In summary, durable and strong mining teeth are essential for maximizing productivity, minimizing downtime, and reducing operating costs in mining and construction applications. Investing in high-quality teeth with superior durability and strength ensures optimal performance, efficiency, and reliability in demanding operating environments.

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UNDERSTANDING THE ADVANTAGES OF THE FORGING PROCESS VS CASTINGS

FORGINGS

- Forging involves shaping metal through the application of compressive forces, typically using a hammer or press. The process typically involves heating the metal to a specific temperature to make it more malleable before shaping it.
- Forging results in a product with superior mechanical properties, including higher strength, toughness, and fatigue resistance. The grain structure of forged parts is typically more uniform and aligned, enhancing their structural integrity and durability.
- Forging allows for precise shaping of parts with complex geometries. Furthermore, at SSP the forging process is fully automated, making the forged mining teeth more consistent in quality.

CASTINGS

- Casting involves pouring molten metal into a mold cavity, allowing it to solidify and take the shape of the mold. The process does not involve applying compressive forces; instead, the metal flows into the mold under gravity or pressure.
- Casting is suitable for producing complex shapes and large parts with intricate details. Cast parts may have lower mechanical properties compared to forged parts, including reduced strength, toughness, and fatigue resistance.
- Castings may exhibit porosity, shrinkage, and other defects due to the cooling and solidification process.

In summary, Forging involves shaping metal through compressive forces, resulting in parts with superior mechanical properties and tighter tolerances.

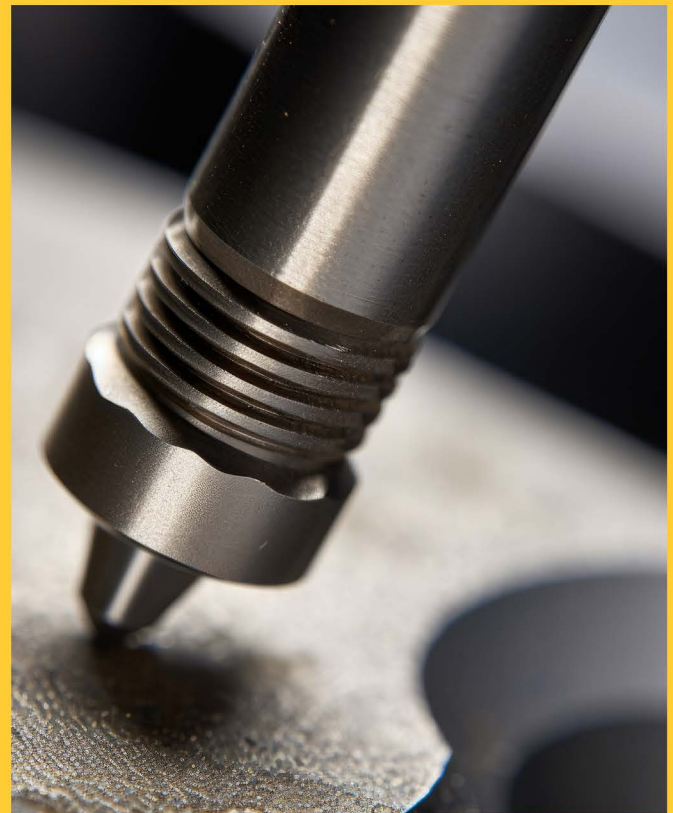
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Structural Integrity of Forgings vs Castings

The structural integrity of forgings generally surpasses that of castings due to several factors inherent to the forging process:

MECHANICAL PROPERTIES OF FORGINGS

1. **Grain Size:** In forgings, the grain size is typically smaller and more uniform compared to castings. Smaller grain size results in a higher density of grain boundaries, which act as barriers to dislocation movement within the metal lattice.
2. **Grain Orientation:** During forging, the metal is subjected to plastic deformation, causing the grains to elongate and align in the direction of applied stress. This directional alignment of grains enhances the material's anisotropic properties, meaning it exhibits different mechanical behaviors along different axes. Components forged with a well-aligned grain structure demonstrate superior mechanical performance and fatigue resistance along the direction of grain flow, contributing to their durability.
3. **Grain Boundary Strengthening:** The presence of grain boundaries in forged materials serves as sites for dislocation pinning and impedes the propagation of defects and cracks. Grain boundaries act as barriers to dislocation movement, increasing the material's resistance to plastic deformation and enhancing its fatigue resistance and toughness.



The fine, uniform, and well-aligned grain structure of a forging enhances the material's strength, toughness, fatigue resistance, and overall mechanical properties, ensuring superior durability and reliability in demanding applications.



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CASE STORY SUCCESS:

FORGED MINING TEETH ACHIEVE 40% LONGER LIFE

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BUILT TO LAST: 40% IMPROVEMENT vs CASTINGS

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FULL-SERVICE FORGING WITH w/ HEAT-TREATING and MACHINING SERVICES

Fully Automated Forging - Extensive In-House Capabilities - Parts Stocking

SSP's advantage lies in their ability to deliver high-volume, high-quality forged products with post-production machining and heat treating services.

When it comes to achieving unmatched quality in forgings, SSP is your ultimate solution. We specialize in forging high-volume, custom parts tailored precisely to your specifications, enabling you to deliver superior solutions to your customers. Unlike other manufacturers, we prioritize forging based on annual projections rather than purchase orders, ensuring consistent excellence in both quality and volume. When you require exceptional quality at scale, trust SSP to exceed your expectations.

**HIGH-VOLUME
CUSTOM FORGING**

**MACHINING AND
HEAT TREATING**

**UNCOMPROMISED
QUALITY CONTROL**



requirements.

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RESHORING MINING AND CONSTRUCTION COMPONENTS

In recent years, there has been a noticeable shift in the manufacturing industry towards re-shoring, a phenomenon where companies bring their production back to their home countries from overseas locations. This trend has been particularly pronounced in industries such as large industrial construction manufacturing.

One of the primary driving forces behind the re-shoring trend is the growing awareness of the risks and challenges associated with offshoring production. Issues such as supply chain disruptions, quality control concerns, and increasing labor costs in offshore locations have led many companies to reconsider the benefits of manufacturing abroad. Large industrial construction manufacturers, in particular, have realized the importance of proximity to their primary markets and the need for more agile and responsive production processes.

*“It pays to
utilize Domestic
Full-Service
Sourcing.”*



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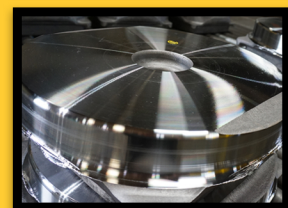
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RESHORING CASE STORY

Large Manufacturer Realizes the Value of Sourcing Their Center Plates Locally

Problem: The customer required high volumes of forged center plates—these parts are extremely difficult to obtain from a North American supplier who can offer a globally competitive price. The typical overseas lead time ranges from a minimum of 20 weeks and in addition, the political climate internationally puts overseas supply chains at high risk. The resulting long lead times and supply chain uncertainty from their current supplier impacted their manufacturing capabilities.

Solution: Southwest Steel Processing (SSP) is fully automated and can forge up to 1,500 center plates per day on its 7,000-ton press forging line. This allows SSP to provide the quantities needed to support the entire rail industry at a globally competitive price, with shorter lead times for the domestic customers.



The largest rail car supplier in North America selected SSP to reshore the forging of 50,000+ Low Profile Center Plates needed to meet their annual needs.



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CUSTOMIZATION AND PRODUCTION OF HEAVY EQUIPMENT AND MINING FORGINGS AT SSP

Southwest Steel Processing (SSP) is fully automated and can forge up to 3,000 parts per day on their two forging lines. This enables SSP to produce large quantities of custom forged components. Recently, SSP had the opportunity to demonstrate the “SSP Advantage” with a customer who needed a reliable source for high volumes of forged and heat-treated mining teeth. This Canadian supplier of heavy-duty mining teeth chose SSP to produce the large quantities they required which ultimately resulted in a shorter lead time compared to their overseas supplier as SSP also has the capabilities and capacity to do the heat-treating needed on these forgings.



THE SSP FULL-SERVICE ADVANTAGE OF FORGING, MACHINING and HEAT TREATING

SSP's heat treating capabilities saves the customer time, money, and hassle of additional suppliers. SSP has the ability to normalize, quench and temper the customer's forgings, eliminating the need for the customer to qualify an additional source, there is no need for purchasing to place another set of orders for the same parts. Lead times and transportation costs are cut down dramatically with a single source forger.

PARTS WE FORGE: Mining Teeth, Stubshaft, Track links, Ball valves, Flanges, Freight Railcar components and more.

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CONCLUSION

FORGED MINING TEETH OUTPERFORM CAST COMPETITORS

In conclusion, the choice between forged and cast claw teeth has significant implications for the performance, durability, and cost effectiveness of heavy machinery and equipment. While castings may offer initial cost savings, the superior mechanical properties and performance of forged claw teeth make them a preferred choice for demanding applications where reliability and longevity are paramount. By investing in forgings, equipment manufacturers and end-users can ensure optimal performance, reduced downtime, and lower total cost of ownership over the lifespan of the machinery.

“Forged mining teeth are proven to optimize performance, reduce downtime and lower overall cost of ownership.”

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