

# Unit Fixed Costs, Not Headcount: How Steel Plants Survive the Cycle



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## Six Levers to Reduce Steel Plant Fixed Cost Per Tonne

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### Executive Summary

Steel's combination of high capital intensity and cyclical demand means survival at the bottom of the cycle is decided by fixed cost per tonne, not by labour productivity or nameplate capacity viewed in isolation. This analysis sets out a practical framework of six levers, organised into two families: shrinking the fixed cost base (organisational change through delayering, multiskilling, and non-core spin-offs, and technology-driven investment that removes an entire process step) and spreading that same base over more tonnes (route-specific operating practice for BF-BOF and EAF plants, plus capacity utilisation and maintenance). Shrinking can be executed on a management timeline regardless of market conditions, making it the more reliable lever in a downturn; spreading typically offers the larger saving but only when a real market exists to absorb the additional tonnes at a genuine contribution to fixed costs — utilisation raised by selling below variable cost accelerates decline rather than reversing it. Drawing on the British Steel Corporation's 1980s restructuring and Nucor's permanently flat management structure, the analysis argues that organisational change is routinely under-rated relative to capital investment, and that unit fixed cost improvement is a shared brief across finance, technical, and human resources leadership rather than a matter for any one function alone.

Steel production is capital-intensive. A single blast furnace reline can cost several hundred million pounds. An electric arc furnace (EAF) mini-mill requires hundreds of millions more before the first tonne is cast. This capital sits on the balance sheet as depreciation whether the plant runs at full output or half of it. Add maintained headcount, insurance, business rates, and financing costs, and the result is a cost structure dominated by expenses that do not fall when demand falls.

Steel demand, unlike steel's cost base, is highly cyclical. Construction, automotive, and infrastructure spending move with the broader economy, and steel producers absorb the full amplitude of that cycle on the revenue side while carrying a largely fixed cost base underneath it. The result is a structural mismatch: costs that barely move, and revenue that swings by 20 to 40 percent between cycle peak and trough — a relationship set out in the underlying data at [Profitability vs Capacity Utilisation](#).

This mismatch, not poor management or weak demand alone, is what pushes marginal producers into loss at the bottom of every cycle. The plants that survive repeated downturns are not necessarily those with the newest technology or the largest capacity — scale and modern process technology both raise the fixed cost base that must be covered, and only translate into a low cost per tonne if utilisation holds up. They are the plants with the lowest fixed cost per tonne, however that position was reached, because a lower fixed cost base needs a smaller volume, at a smaller margin, to break even.

This raises the central question for any steel producer's board or lender: what actually determines unit fixed cost — fixed cost per tonne — and what can management do about it, particularly when demand cannot be controlled? This article sets out a practical framework, and six categories of lever, for answering that question.

## Two Families of Fixed Cost Action

Fixed cost per tonne has exactly two components: the size of the fixed cost base itself, and the number of tonnes over which that base is spread. Every lever available to a steel producer works through one of these two mechanisms, and no other. This gives a simple organising principle for what would otherwise be a long, unstructured list of technical and organisational initiatives.

**Shrinking the base** means permanently removing cost that does not depend on how much steel is made — headcount unrelated to core steelmaking, organisational layers, or, in the case of certain technology investments, entire process steps such as a soaking pit or a full-length reheat furnace.

**Spreading the base** means keeping the fixed cost base as it stands but producing more tonnes from it — running assets closer to nameplate capacity, reducing unplanned downtime, and cutting the cycle time of batch processes such as the EAF or the BOF.

These two families explain why superficially unrelated initiatives, such as spinning off the plant gardening contract and reducing basic oxygen furnace tap-to-tap time, belong in the same strategic conversation. Both reduce the same number: fixed cost per tonne. They simply attack it from opposite

exists to sell the additional tonnes into at a genuine contribution to fixed costs. The reasoning behind that sequence is set out in full in the conclusion, and discussed further in the Steelonthenet.com podcast, [Episode 002: Profit Improvement Programmes](#).

## Six Categories, Two Families

The table below maps the framework this article develops in detail: six practical categories of lever, each assigned to whichever fixed cost family it primarily serves. Items marked with an asterisk also appear on the [EU Best Available Techniques \(BAT\)](#) reference list for the iron and steel sector, and therefore typically carry a combined productivity and energy efficiency justification, discussed further below.

| # | Category                  | Levers                                                                                                                                                                            |
|---|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Organisational            | Delayering, multiskilling, non-core spin-offs                                                                                                                                     |
| 2 | Technology-Driven         | Continuous casting, thin slab casting (CSP®), direct/endless strip casting (ESP, CSP® Nexus, Direct Sheet Plant), MIDA / CMT® (long products), twin-shell furnace, DC arc furnace |
| 3 | BF-BOF Operating Practice | Burden distribution/PCI optimisation*, BF top charging system*, BOF tap-to-tap time, hot metal logistics                                                                          |
| 4 | EAF Operating Practice    | Tap-to-tap time reduction, scrap yard optimisation, scrap pre-heating*, oxy-fuel burners*, bottom stirring/gas injection*, foamy slag practice, ladle furnace/caster sequencing   |
| 5 | Rolling & Downstream      | Hot charging, automatic roll change, caster-mill scheduling coordination                                                                                                          |
| 6 | Universal                 | Capacity utilisation (including BF and BOF availability/uptime as asset-level drivers), preventative/predictive maintenance                                                       |

\* Asterisked items appear on the EU Best Available Techniques reference list for the iron and steel sector, and also deliver recognised energy and emissions efficiency benefits alongside their productivity effect — see the explainer below.

## Shrinking the Base: Organisational Levers

The fastest fixed cost reductions available to a distressed steel producer are organisational, because they can be executed on a management timeline rather than a capital or market timeline.

Integrated steel plants historically accumulated multiple layers of supervisory management between the shop floor and the plant director. Each layer carries salary cost, but more importantly slows decision-making precisely when a cyclical downturn demands speed. Reducing organisational levels is therefore both a direct cost saving and an operational responsiveness improvement.

[Nucor](#) offers a useful contrast to the layering case examined below. Rather than trimming an existing bureaucracy, Nucor was built flat from the outset under Ken Iverson, historically running just four management layers between hourly workers and the chairman, against ten or more layers typical of comparable large manufacturers<sup>10</sup>. Where layering is a crisis response, Nucor demonstrates flatness sustained as a permanent structural advantage, embedded in the organisation from inception rather than imposed on it after the fact.

## Multiskilling

Traditional steel plants organised labour into narrow trade demarcations. A mechanical fitter would not perform electrical work, and vice versa. Cross-training workers to cover multiple disciplines reduces the total headcount required to maintain the same coverage across shifts, without reducing the availability of any single skill.

Layering and multiskilling are not new ideas. Both were central elements of the restructuring of the British Steel Corporation from the late 1970s through the 1980s, where reducing management layers and breaking down rigid craft demarcations were among the principal levers used to bring the business back towards viability. BSC's history as a nationalised producer also raises a broader question relevant to any state-owned steelmaker facing the same fixed cost pressures, examined in

[Governments as Steel Company Owners: Does Nationalisation Work?](#)

See also: [Is Domestic Steel Production Essential for Economic Development?](#), which examines the relationship between capital intensity, headcount, and employment claims in more detail.

## Non-Core Spin-Offs

A large integrated steel site historically operated far more than a steel plant. Catering, cleaning, medical services, security, gardening, and internal transport were commonly run as in-house functions, carrying full-time headcount, management overhead, and capital equipment entirely unrelated to steelmaking capability. Spinning these off to specialist external contractors removes this cost from the fixed base entirely. The producer pays only for what it consumes, and the specialist contractor, operating across multiple clients, can typically deliver the same service at lower unit cost through its own scale.

Some auxiliary functions closer to the core process, such as water treatment plant operation, air separation, on-site power generation, and slag treatment, are sometimes contracted out on similar logic, though these decisions require more care, since they sit closer to production continuity than gardening or catering.

NewCo failure in the critical first years, and are common practice in successful steel sector restructuring. EU restructuring and transition funding, discussed in [European Steel Action Plan 2025](#), is one real-world source of this kind of support for spun-off entities.

Taken together, delayering, multiskilling, and non-core spin-offs point to a broader conclusion. The organisational lever is routinely under-rated relative to capital investment, not because it delivers less, but because it rarely receives the same evaluative discipline, and rarely has the same seat at the table. A furnace reline is modelled, costed, and approved through a capital committee; an extra management layer is not modelled at all. Finance directors who scrutinise capex business cases in detail often accept organisational structure as a historical given rather than a decision. Technical directors who optimise process flow with real rigour frequently leave headcount structure to someone else entirely. And Human Resources or personnel directors, who typically do own that structure operationally, are rarely framed as owning it as a fixed cost lever — organisational design gets treated as a people question rather than a cost question, even though it moves the same number a furnace investment does. Iverson's flat structure at Nucor was not an accident of culture; it was a decision, held to the same standard as any other structural choice about cost. Unit fixed cost improvement is a shared brief across finance, technical, and Human Resources leadership, not a matter for any one of them alone.

## Shrinking the Base: Technology-Driven Investment

A smaller number of levers shrink the fixed cost base not through organisational change, but by removing an entire process step from the production route. These require capital, and are therefore generally only available to producers with access to investment funding, but the effect, once made, is structural and permanent rather than a one-off saving.

### The Casting-to-Rolling Spectrum

The clearest example is the progressive elimination of the reheating furnace. Conventional practice casts steel into slabs of 200 to 250 millimetres thickness, allows them to cool, and later reheats them fully before rolling, a separate process step with its own capital, energy, and labour cost.

**Continuous casting** replaced ingot casting decades ago, eliminating the soaking pit and primary mill stage entirely and lifting yield from around 85 to 90 percent under ingot casting to 96 to 98 percent<sup>1</sup>. The mechanisms behind this kind of yield gain, and how to recover the hidden cost of yield loss more generally, are explored further in the Steelonthenet.com podcast, [Episode 006: Steel Mill Yield Losses — Hidden Costs & Profit Recovery](#).

**Thin slab casting**, commercialised as SMS group's **CSP**® process, casts slabs at 50 to 90 millimetres rather than 200 to 250 millimetres. The slab passes through a short equalising furnace rather than a full reheat cycle<sup>2</sup>.

separate reheat furnace stage, producing hot rolled coil in as little as five minutes from liquid steel<sup>2</sup>.

For long products, rebar, wire rod, and sections, the equivalent technology is offered by two competing suppliers: Danieli's [MIDA](#) plant and SMS group's Continuous Minimill Technology ([CMT](#)®), both integrating scrap charging, melting, casting, and rolling into a single line and eliminating the separate reheat furnace stage<sup>3</sup>. These should be understood as two commercially available systems delivering the same underlying productivity concept, rather than two distinct techniques.

## Melt Shop Configuration

Twin-shell electric arc furnaces reduce fixed cost through equipment design rather than operating discipline, allowing one shell to charge and preheat scrap while the other melts, which is a capital solution to the same cycle-time problem addressed operationally in the [EAF](#) section below. Direct current ([DC](#)) arc furnaces lower electrode and refractory consumption through the same logic of removing cost via equipment specification rather than practice.

## Spreading the Base: Universal Levers

The spreading family begins here. Where the two shrinking categories just examined permanently remove cost from the base, everything from this point onward works by producing more tonnes from the same fixed cost base rather than reducing that base itself. Two levers apply regardless of production route.

### Capacity Utilisation

Capacity utilisation matters at both plant and industry level, though for different reasons. At industry level, persistent global overcapacity, projected to push utilisation down to around 70 percent by 2027<sup>4</sup>, reflects a dual structural failure. State intervention undermines natural barriers to entry, permitting uneconomic capacity to be added in the first place, while high barriers to exit then trap that capital in the industry once built — examined in detail in [Steel Overcapacity: Barriers to Entry and Exit](#). At plant level, however, a producer's own utilisation rate is a direct and largely self-determined driver of fixed cost per tonne, examined further in the Steelonthenet.com podcast, [Episode 007: Capacity Utilisation — The Steel Industry's Most Powerful Predictive Metric](#). A facility running at 53 percent of nameplate capacity, as has been the case at Scunthorpe, is spreading its full fixed cost base over roughly half the tonnes it was designed for, which is frequently the single largest driver of loss-making operation<sup>5</sup>. Closing this gap is often the fastest available lever for individual plant survival, largely independent of what is happening industry-wide<sup>6</sup>. It only works, however, where the additional tonnes make a genuine contribution to fixed costs rather than simply adding volume<sup>7</sup> — the failure mode explored in [Zombie Steel Mills: Why State Aid Delays the Inevitable](#), where subsidised producers keep running tonnes that make no genuine contribution at all.

Every other lever in this article assumes the asset is running. Unplanned downtime, whether a blast furnace cooling system failure or an electrode breakage on an [EAF](#), erases the benefit of every other productivity initiative for its duration. Predictive maintenance, using vibration, temperature, and load sensor data to flag failures before they occur, has become standard practice precisely because it protects the gains made elsewhere.

## Spreading the Base: BF-BOF Operating Practice

In an integrated blast furnace-basic oxygen furnace ([BF-BOF](#)) plant, the blast furnace is the anchor asset, expensive, slow to restart, and designed to run continuously for a campaign of fifteen to twenty years between relines. This changes which levers matter most, and the cost structure behind them is set out in detail in the Steelonthenet.com [BOF Cost Model](#).

### Burden Distribution and PCI Optimisation

Burden distribution and pulverised coal injection ([PCI](#)) optimisation is a proven, well-documented lever. Japanese integrated mills achieve blast furnace productivity of 2.2 to 2.4 tonnes per cubic metre per day, against a European average of 1.8 to 2.0, a 20 to 30 percent gap attributable largely to decades of incremental process control discipline rather than a single capital project<sup>8</sup>.

### Basic Oxygen Furnace Tap-to-Tap Cycle Time

The interval between successive heats governs how many heats, and therefore how many tonnes, a given vessel can produce per day. Efficient oxygen lance practice and minimised vessel downtime increase this without new capital.

### Hot Metal Logistics

Hot metal logistics between the blast furnace and the basic oxygen furnace is a frequently underrated lever. Poor scheduling forces either the blast furnace to hold hot metal, risking temperature loss, or the basic oxygen furnace to wait idle. Tight scheduling keeps both assets running at their designed rate.

## Spreading the Base: EAF Operating Practice

An electric arc furnace mini-mill has a fundamentally different bottleneck structure. The furnace operates in batches rather than continuously, so cycle time reduction, not availability over a multi-year campaign, is the dominant lever, with the underlying cost structure set out in the Steelonthenet.com [EAF Cost Model](#).

This is usually the single largest lever available in an EAF shop. A modern rebar mini-mill's heat cycle typically runs 35 to 60 minutes. Cutting five minutes from a 45-minute cycle is roughly an 11 percent output increase, achieved almost entirely through operating discipline rather than capital spend.

### **Scrap Yard and Charging Optimisation**

This affects melt-in time directly. Poorly packed scrap buckets, with excessive light scrap, slow melt-down and raise electrical energy consumption per tonne.

### **Foamy Slag Practice**

Foamy slag practice shields the arc, allowing higher power input without excessive electrode and refractory wear, a correctable operating practice rather than a capital investment.

### **Ladle Furnace and Caster Sequencing**

This ensures the melt shop and the caster run in step. If the caster sits idle awaiting the next heat, or the furnace holds liquid steel awaiting caster readiness, both assets lose productivity simultaneously.

## **Spreading the Base: Rolling and Downstream**

These levers apply after either route, BF-BOF or EAF, once liquid steel has become cast slab or billet.

### **Hot Charging**

Charging slabs into the reheat furnace at 650 to 700°C rather than allowing full cooling delivers a 28 percent increase in furnace throughput, a 0.55 gigajoule per tonne fuel saving, and a 27 kilogramme per tonne reduction in carbon dioxide emissions<sup>9</sup>.

### **Automatic and Rapid Roll Change**

These systems, using pre-set roll change carriages and hydraulic quick-clamping, cut changeover downtime from 15 to 30-plus minutes to under five minutes, a direct recovery of bottleneck mill hours.

### **Caster-to-Mill Scheduling Coordination**

This avoids the situation where a single cold slab in the sequence slows the entire furnace queue, improving effective line rate at no capital cost.

operating practices, developed under the [UK Industrial Emissions Directive](#). Regulators and operators recognise them as achieving a high standard of environmental performance while remaining technically and economically viable at industrial scale for the iron and steel sector.

[BAT](#) were developed primarily as an environmental and energy efficiency framework. A significant number of the listed techniques carry a second benefit that is easy to overlook: they also improve yield and, in several cases, reduce the labour and maintenance burden associated with a given process step. Pulverised coal injection, bottom stirring and gas injection, and scrap pre-heating, all asterisked in the earlier framework table, are cases in point. Each was assessed and listed primarily for its energy or emissions performance, yet each also delivers a measurable productivity gain through faster cycle times or reduced fuel and material handling.

This is why the BAT-based levers marked in the earlier framework table are worth prioritising where capital is available: the investment case does not rest on productivity alone, and can typically draw on decarbonisation or energy-efficiency financing routes as well. For the full [BAT](#) reference list across every stage of iron and steel production, see the Steelonthenet.com [Steel Sector BAT Checklist](#). For a discussion of how these techniques are selected and applied in practice, see the Steelonthenet.com podcast episode [Best Available Techniques in Iron and Steel](#).

## Conclusion

Fixed cost per tonne, not tonnes per employee, is the number that decides whether a steel plant survives the bottom of the cycle. A plant can have excellent labour productivity and still fail if it carries cost unrelated to steelmaking, or runs its assets well below the capacity for which they were designed — and, as the British Steel Corporation's own restructuring showed decades ago, the fastest fixes are often organisational rather than technical.

There are six practical categories of lever — organisational, technology-driven, BF-BOF operating practice, EAF operating practice, rolling and downstream, and universal — but only two ways to move the underlying number: shrink the fixed cost base, or spread it over more tonnes. Shrinking is the more reliable lever in a downturn, since it can be executed regardless of market conditions. Spreading typically offers the larger saving, but only when a real market exists to sell into. Volume sold below variable cost does not spread the fixed cost base — it destroys it, one loss-making tonne at a time.

Route matters too: availability governs a blast furnace, cycle time governs an [EAF](#), and both are spreading levers that run the existing base harder rather than changing it. Only the shrinking family — organisational change and technology-driven investment — alters the base itself; every operating-practice lever, on either route, works by running that same base harder. This is also why scale and modern technology are not a substitute for this discipline: both raise the size of the fixed cost base that then has to be spread, and neither guarantees a low cost per tonne on their own.

nameplate capacity are worth little if the fixed cost base behind them is not also under control. The plants that survive are the ones whose management tracked fixed cost per tonne directly and used it to guide decisions, rather than assuming a good productivity or capacity utilisation figure meant the underlying cost position was safe. That management task belongs to finance and technical leadership together, and, given how much of the fixed cost base is organisational, to human resources leadership as well.

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