

Intelomelt

A Smart Foundry Platform for Autonomous Charge

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Who We Are

Castings Tasmania is the oldest foundry in the Southern Hemisphere, commencing business in 1834. Castings Tasmania has been delivering high-integrity castings and engineering solutions to critical industries throughout Australia and beyond.

At a Glance



Established: 1834



Casting Capacity: 50 kg to 5 tonnes



Materials: Carbon Steel, Alloy Steel, Grey and SG Iron Wear Alloys



Capabilities: Casting, Heat Treatment, Machining & NDT



Markets Served: Mining, Energy, Rail & Transport, Energy & Infrastructure, Defence & General Manufacturing.

A heat that was calculated correctly, and failed
anyway

0.379

% CARBON, AS TAPPED

SAE 8630 specification

C 0.28 – 0.33 %

Out of specification by 0.049 %

Scrapped or downgraded. Every element was
calculated correctly.

Nobody made a mistake. Sometimes, the method made the mistake.

The Challenge in Induction Furnace Foundries Today



Manual Chemistry Calculations

Charge calculations done on paper or spreadsheets — slow, error-prone, and inconsistent across shifts.



Costly Off-Chemistry Heats

Missing targets wastes expensive alloy additions and forces re-melts, costing time and money every heat.



No Optimised Scrap Mix

Without LP optimisation, the cheapest combination of available scrap and returns goes unused every time.



No Metallurgical Decision Support

Trim decisions and alloy substitutions rely on individual knowledge — no system guidance or audit trail.



CORE

Charge Calculator

Build multi-material charges against any grade. Chemistry predicted before the first scrap hits the furnace.



TRIM

Trim Correction

Enter spectro results, get instant alloy addition quantities to hit aim chemistry. 2% rebath alert included.



AI OPTIMISE

Cost Optimiser

LP solver finds the lowest-cost scrap blend that meets spec, returns constraints, and melt loss factors.



LOG

Heat Log

Every heat saved with full traceability — charge items, chemistry, temperatures, alloys, operator, DI result.



IMPORT

Spectro Link

Auto-import Belec WinOE Network Protocol CSV. Bath and final samples. Zero manual typing errors.



DI

Hardenability (DI)

Grossmann Ideal Diameter from actual heat chemistry per ASTM A255. Saved to heat log automatically.



AI

AI Metallurgist

Ask metallurgical questions in plain English. Context-aware answers using your live heat and grade data.



STOCK

Scrap Inventory

Track scrap and alloy stock levels. Low-stock alerts. Cost per kg. Recovery % per material.



LIBRARY

Grade Library

312+ built-in grades — cast steel, cast iron, stainless. Full chemistry limits. Editable benchmarks.

Intelomelt: What a calculation engine changes on the melt deck

First-sample accuracy

Charge chemistry lands inside the aim band, so the first spectro sample is a confirmation rather than a starting point.

No over-correction

Carbon arriving in the ferroalloys is counted before graphite is added. The trim stops short of the specification ceiling.

Lowest-cost charge

Every combination of scrap, returns and alloy is searched, not just the first that works — worth \$83 a tonne on the example later.

Consistency across shifts

The same bath gives the same recommendation at 3am as it does at midday. The method does not vary with who is on.

A record that survives

Every heat, every sample, every addition logged against the grade. Traceability without a clipboard.

Decisions explained

The system shows which element drove each addition, so the metallurgist can overrule it knowing why.

PART ONE

Why a spreadsheet cannot do this

Three ways a charge sheet lets a heat go wrong

1

The formula gets overwritten

Someone types a number over a live cell to force the answer they want on one heat. The sheet keeps calculating as though nothing changed. Every heat after that inherits it, and nothing on the screen says so.

2

One element at a time – sometimes Macro for multiple

The carbon formula runs before the ferroalloy quantities are known. What the ferromanganese and ferrochrome carry with them is invisible to it — the cell has already returned its answer.

3

One mix, not the best mix

A sheet evaluates the charge you typed. It cannot tell you that a different combination of the same yard meets the same chemistry for less, because it never looks.

WHAT A SOLVER DOES INSTEAD

Every material declares its full analysis. All elements are balanced in one system of equations, recovery applied per element per material — and the whole yard is searched, not just the mix you thought of.

The carbon budget — SAE 8630, 5,000 kg bath

Melt-in sample C 0.18 % · aim 0.30 % · deficit 6.00 kg C · maximum 0.33 %

Addition	Charged for	kg	C in alloy	C delivered
HC ferromanganese	Mn 0.35 → 0.80	34.8	6.5 %	1.92 kg
HC ferrochrome	Cr 0.12 → 0.50	34.1	7.0 %	2.03 kg
Nickel cathode	Ni 0.20 → 0.55	17.9	0.02 %	0.00 kg
Ferromolybdenum	Mo 0.04 → 0.20	12.7	0.10 %	0.01 kg
Ferrosilicon 75	Si 0.08 → 0.25	12.6	0.10 %	0.01 kg
Carbon arriving uninvited				3.97 kg

SPREADSHEET — carbon solved alone

7.2 kg graphite

Final C 0.379 % — 0.049 over the maximum

SOLVER — carbon budget balanced

2.4 kg graphite

Final C 0.300 % — on aim

PART TWO

Designing the charge before the furnace is loaded

The melting workflow, end to end

1

Grade and tap weight

Aim chemistry and the returns rule for that grade load automatically.

2

Charge design

Scrap, returns and alloy by weight. Predicted chemistry updates as you build.

3

Charge optimisation

The solver proposes the lowest-cost mix that satisfies every element.

4

Melt and sample

First spectro sample taken from the bath.

5

Trim correction

Deficits computed, additions proposed, carbon interactions balanced.

6

Tap and record

Heat logged with full chemistry, additions and cost against the grade.

Steps 3 and 5 are where the arithmetic lives. Everything else is bookkeeping — necessary, but not where heats are won or lost.

What the optimiser is actually solving

OBJECTIVE

Minimise $\Sigma (\text{weight} \times \text{cost/kg})$

across every scrap, return and alloy on hand

Why a solver rather than a rule

A yard with 20 materials and 8 controlled elements has more valid charge combinations than anyone can evaluate by hand. A rule finds one that works. The solver finds the cheapest one that works, and proves no cheaper one exists.

SUBJECT TO

● Chemistry

Each element held between its grade minimum and maximum, after recovery

● Returns rule

Per-grade minimum and maximum on foundry returns in the charge

● Stock on hand

No material used beyond what is physically in the yard

● Per-material cap

Operator limit on any single material's share of the charge

● Melt loss

Recovery applied per material — scrap and returns differ

Optimised charge — SAE 8630, 5,000 kg tap

Material	Type	kg	Recovery	Cost
8630 foundry returns	Return	1,920	97 %	\$864
Low-alloy steel scrap	Scrap	2,640	94 %	\$1,373
Mild steel punchings	Scrap	520	94 %	\$198
HC ferromanganese	Alloy	34	85 %	\$66
HC ferrochrome	Alloy	41	90 %	\$98
Ferromolybdenum	Alloy	16	97 %	\$544
Nickel cathode	Alloy	21	98 %	\$368

Charge weight

5,192 kg

Tap weight

4,975 kg

Returns in charge

37 %

Charge cost

\$3,511

PREDICTED CHEMISTRY AT MELT-IN

C

0.29

0.28–0.33

Si

0.24

0.15–0.35

Mn

0.78

0.70–0.90

Cr

0.49

0.40–0.60

Ni

0.53

0.40–0.70

Mo

0.19

0.15–0.25

What the optimised mix is worth — same grade,

	Charge by habit	Charge by solver	Difference
Foundry returns used	1,000 kg (19 %)	1,920 kg (37 %)	+920 kg
Bulk scrap and returns	\$2,326	\$2,434	+\$108
Alloy additions	\$1,735	\$1,076	-\$659
Ferromolybdenum	26 kg	16 kg	−10 kg
Nickel cathode	34 kg	21 kg	−13 kg
Charge cost	\$4,061	\$3,511	-\$550

Saved per heat

\$550

Per tonne tapped

\$83

Share of charge cost

13.6 %

THE SAVING IS THE ALLOY BILL, NOT THE SCRAP BILL

Foundry returns already carry chromium, nickel and molybdenum. Under-using them pushes the heat onto ferromolybdenum and nickel cathode — the two most expensive materials in the yard.

Indicative prices. The gap scales with the spread between your alloy and scrap prices, and narrows if your returns handling is already disciplined — so run it on your own library before quoting a number.

PART THREE

From spectro result to bath addition

Trim Correction — Spectro to Target in One Click

1

Enter / Auto Import spectro results

Input C, Si, Mn, S, P, Cr, Ni, Mo, Cu from the furnace sample.

2

System calculates

Deficit per element computed. Cheapest alloy selected, respecting C-budget interactions.

3

Review & adjust

All 9 alloys shown as editable rows. Edit quantities as needed.

4

Rebath alert

If total additions > 2% of furnace weight: amber banner — take another bath sample.

5

Save & print

Re-run projection, save trim record and print trim report (no pour temperature).

Trim Correction Output

Element	Aim %	Actual	Deficit	Alloy	Qty
C	0.45	0.38	-0.07	GRAF	2.1
Si	1.20	1.05	-0.15	FESI	3.8
Mn	0.80	0.65	-0.15	HCMN	2.5
Cr	0.55	0.55	—	—	—
Ni	0.40	0.40	—	—	—

⚠ 2% Rebath Alert

If total additions exceed 2% of furnace weight, take another bath sample before proceeding.

⚠ Element exceeds limit — Dilution may be required

⚠ Over aim: C=0.200% (aim 0.100%)

✕ Open Dilution Calculator

How the trim is calculated

ADDITION, KG

$$\frac{(\text{aim } \% - \text{actual } \%) \div 100 \times \text{bath kg}}{\text{assay fraction} \times \text{recovery fraction}}$$

Three things most hand calculations get wrong:

assay · recovery · what else the alloy carries

- 1 Deficit per element**

Aim minus actual, converted to kilograms against the bath weight.
- 2 Carbon budget first**

Carbon arriving in the ferroalloys is subtracted before any graphite is proposed.
- 3 Cheapest qualifying source**

Each element costed per kilogram delivered, after assay and recovery.
- 4 Ceiling margin held**

Additions stop short of the specification maximum, leaving room for sample variation.

Worked trim — the same 8630 bath, 5,000 kg

The hand-designed charge from Part One, which came in low across the board — not the optimised charge two slides back.

Element	Aim %	Actual %	Deficit %	Addition	kg
Carbon	0.30	0.18	0.12	Graphite	2.4
Silicon	0.25	0.08	0.17	FeSi 75	12.6
Manganese	0.80	0.35	0.45	HC FeMn	34.8
Chromium	0.50	0.12	0.38	HC FeCr	34.1
Nickel	0.55	0.20	0.35	Ni cathode	17.9
Molybdenum	0.20	0.04	0.16	FeMo	12.7

Total additions

114.5 kg

Share of bath

2.29 %

Trim cost

\$920

Over the 2 % rebath
threshold

Second sample required

Carbon: deficit 6.00 kg, of which 3.97 kg arrives in the ferromanganese and ferrochrome.

Graphite is therefore 2.4 kg, not 7.2 kg. Same deficit, same aim — a third of the addition, and the difference between 0.300 and 0.379 % C.

Where machine reasoning helps — and where it does not

USEFUL FOR

- **Reading a deviation pattern** across a run of heats and naming a likely cause
- **Finding the nearest standard grade** to an unfamiliar customer chemistry
- **Suggesting an alloy substitution** when the usual one is out of stock
- Writing the **shift handover note** from the heat log
- Explaining **why the optimiser chose a mix** the operator did not expect

NOT USED FOR

- Calculating the addition. That is arithmetic and belongs in a solver, not a language model
- Deciding whether a heat is within specification
- Anything that goes to the furnace without a person reading it first
- Replacing the metallurgist's judgement on a grade they know

Deviation analysis — a worked question

OPERATOR ASKS

“Last six 8630 heats have all come in low on manganese at first sample. Charge has not changed. Why?”

SYSTEM RESPONSE

Observation

Mn at first sample has fallen from 0.78 to 0.71 average over six heats, while Si and Cr are unchanged.

Most likely cause

Manganese recovery has dropped. Mn is the most oxidation-sensitive of the three — a change in slag practice or a hotter, longer hold affects it first.

Check first

Tap temperature and hold time against the previous run of heats. Then the FeMn certificate — a 78 % grade substituted for 75 % reads as a recovery loss.

If confirmed

Adjust the Mn recovery factor on the material record. The charge calculation will be compensated for in the next heat.

Next: recovery factors the system works out for

TODAY

Recovery is a number typed into the material record — 97 % on manganese, 98% on chromium — set once from experience and rarely revisited.

1

Every heat is already a measurement

Melt-in spectro, every addition with its weight, post-trim spectro. The log is a labelled record of what went in and what the bath actually did.

2

Back-calculate what really happened

Actual recovery = element gained in the bath ÷ element charged. One figure per material, per element, per heat — arithmetic, not a model.

3

Average over a rolling window

Per material, per furnace. A single heat is noise; sixty heats is your recovery. That replaces the typed-in constant with your own history.

4

Watch the trend, not just the mean

Manganese recovery sliding 85 → 78 % over three weeks is slag practice, a hotter hold, or a new supplier — surfaced before it costs heats.

GUARD RAILS

It proposes; it never applies. A minimum number of heats must pass before it says anything; the metallurgist approves the change, and the old value stays on the record. **This is on the roadmap.**

In the system at



Intelomelt Adoption Since May 2026

- 170 heats calculated and processed
- \$70-\$80 savings opportunity per tonne through optimized melt charge management

312-grade library

ASTM, BS, ISO, AS, SAE and EN, with per-grade returns rules and aim tolerance of $\text{aim} \times 15 \% + 0.02 \%$.

Heat log and reports

Every heat, spectro record, addition and cost stored against the grade. Printable charge and trim reports.

Material inventory

276 materials with live stock. The optimiser only proposes what is physically in the yard.

Hardenability and CE

Grossmann DI, a 15-point Jominy curve and carbon equivalent from the logged chemistry — useful at the quoting stage.

Supporting capability rather than the argument — happy to go through any of it in the backup slides

What this is really about

Every foundry in this room already knows how to make this chemistry.

The real test is consistency: can we deliver the same result every time?

- **Simultaneous, not sequential**

Elements solved together, so what the ferroalloys carry is counted before the graphite goes in

- **A margin below the ceiling**

Corrections stop short of the specification limit, leaving room for the next sample

- **The same answer every shift**

The method does not depend on who is on the deck or how long they have been there

- **Arithmetic in the solver, judgement with the metallurgist**

The machine does what it is good at and nothing more

Testimonial

I believe the new charge calculator developed by Sundresh is a significant step forward for our site. Our previous process relied on a general-purpose Excel spreadsheet, which required manual inputs, was prone to user error, and was not designed around our operation. The new program is purpose-built for our site's specific requirements and reflects how we actually work on the floor.

Key benefits:

- **Ease of use:** The program is intuitive and quick to learn. New users were comfortable with it after [timeframe, e.g., one shift / a short walkthrough], compared with [timeframe] for the old spreadsheet.
- **Improved chemistry accuracy:** The calculator takes the guesswork out of building our charge, helping us hit target chemistry more consistently.
- **Time savings:** Charge calculations that previously took 10 - 15 minutes now take 5 to 10 minutes and sometimes shorter.
- **Cost control:** More accurate charging has reduced [e.g., additions, rework, scrap, or material waste], resulting in an overall saving for the foundry
- **Consistency across personnel:** All operators work from the same standardized tool, reducing variation between users and shifts.

Overall, this program is a substantial improvement over our old process and will be a lasting benefit to our site as we move forward. I would like to thank Sundresh for the effort and expertise put into developing it.

Regards,



Vale Maynard

Core message from Melt & Pour Leader: Ease of use, charge calculation accuracy reduces calculation time, enhances cost control, and standardises foundry operations, delivering measurable operational and long-term business value.

Thank You

Intelomelt

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- ✓ Charge Calculator + LP Optimiser — lowest cost every heat
- ✓ Trim Correction with 2% rebath alert
- ✓ Unlimited Grades can be managed
- ✓ AI Metallurgical Assistant — Ollama / Groq / Gemini / Anthropic
- ✓ Hardenability DI Calculator

Backup Slides

Grade Manager

Add, edit, or delete metal grades from the `meta/metal_specs.csv` immediately.

+ Grade Manager

Grade Limits

+ Material Manager

Stock / Inventory

ADD NEW GRADE

GRADE CODE *

e.g. 201

DESCRIPTION *

e.g. 30C Manganese Steel

 **AIM CHEMISTRY & LIMITS (%)** Aim = target aim %, Min/Max = acceptance limits used in trim correction and comparison. Leave Min/Max blank to use $\pm 15\%$ auto-tolerance.

	C	Si	Mn	Cr	Ni	Mo	Cu	S	P
Aim %	0	0	0	0	0	0	0	0	0
Min %	auto	auto	auto	auto	auto	auto	auto	auto	auto
Max %	auto	auto	auto	auto	auto	auto	auto	auto	auto

 Auto-fill limits from aim $\pm 10\%$

 Clear all limits

Max Returns % 60

 **STEEL DEOX & LADLE ADDITIONS** % of heat weight — e.g. 0.025 = 0.025% of tap weight

AL FURNACE
FA1240

0

AL LADLE
FA1240

0

HYPERCAL
FA1364

0

FE-SE
FA1365

0

CA-SI-MN
FA1190

0

FE-SI-ZR
FA1210

0

FE-TI70
FA1180

0

FE-B
FA1160

0

 **IRON / SG INOCULANTS** % of heat weight — e.g. 0.50 = 0.50% of tap weight

MG-FE-SI (NODULARISER) FA1011

0

— kg

BARINOC (INOCULANT) FA1070

0

— kg

SUPERSEED (INOCULANT) FA1197

0

— kg

 Save Grade

Materials Manager

Add, edit, or delete scrap materials. Changes are saved to the database.

+ Grade Manager

+ Grade Limits

+ Material Manager

+ Stock / Inventory

ADD NEW MATERIAL

CODE *

e.g. FS9999

DESCRIPTION *

e.g. Mild Steel Scrap

CATEGORY

Scrap / Return

COMPOSITION (%) Enter composition % — leave 0 if element is absent

C %

0

SI %

0

MN %

0

CR %

0

NI %

0

MO %

0

CU %

0

S %

0

P %

0

COST (\$/KG)

0



Save Material

ALL MATERIALS

All categories

Filter by code or name...

CODE	DESCRIPTION	CAT.	C%	SI%	MN%	CR%	NI%	MO%	COST \$/KG	RECOVERY %	ACTIONS
AL_ING	Aluminium Ingot (Deox)	Alloy	0.02	0.10	0.00	0.00	0.00	0.00	\$2.80	97%	Edit Del
CARB_A	Anthracite Carbon (92%C)	Alloy	92.00	2.00	0.00	0.00	0.00	0.00	\$0.60	90%	Edit Del
CARB_C	Calcined Petroleum Coke (99%C)	Alloy	99.00	0.20	0.00	0.00	0.00	0.00	\$0.85	95%	Edit Del
CASIN	Calcium Silicon (30%Ca)	Alloy	0.20	60.00	0.00	0.00	0.00	0.00	\$4.80	88%	Edit Del
COBALT	Cobalt Metal (99%)	Alloy	0.02	0.10	0.00	0.00	0.00	0.00	\$28.00	99%	Edit Del
CU	Copper	Alloy	0.00	0.00	0.00	0.00	0.00	0.00	\$9.60	99%	Edit Del
CU_CAT	Copper Cathode (99.9%)	Alloy	0.01	0.01	0.00	0.00	0.00	0.00	\$9.20	99.5%	Edit Del
FEB	Ferro Boron (17%)	Alloy	0.50	1.00	0.00	0.00	0.00	0.00	\$12.00	90%	Edit Del
FECR	Ferro Chromium HC (60%Cr)	Alloy	4.50	0.60	0.00	60.00	0.00	0.00	\$2.80	98%	Edit Del
FECR_LC	Ferro Chromium LC (55%Cr)	Alloy	0.10	1.20	0.00	55.00	0.00	0.00	\$4.50	98%	Edit Del
FECR_MC	Ferro Chromium MC (50%Cr)	Alloy	1.50	1.00	0.00	50.00	0.00	0.00	\$3.20	98%	Edit Del

Material Inventory

Maintain your on-hand scrap inventory. The AI Charge Mix Optimiser automatically uses these quantities as constraints — it will never suggest more than what you have available.

+ Import all materials (scraps, returns, alloys)

Filter by code or description...

All status

All types

+ Add item

269 scraps tracked 269 OK 0 Low 0 Critical X 0 Out of stock \$17278384 est. value

CODE	DESCRIPTION	TYPE	ON HAND (KG)	RESERVE (KG)	AVAILABLE (KG)	COST (\$/KG)	USAGE / STOCK	STATUS	ACTIONS
SCRAPS 53 items									
FS1010	Punchings Test	Scrap	1500	200	1,300	\$0.188		✓ OK	Edit ✕
FS1010-20	Silicon Steel Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.233		✓ OK	Edit ✕
FS1012	Stubs with Cast Iron Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.187		✓ OK	Edit ✕
FS1013	Stubs without Cast Iron Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.181		✓ OK	Edit ✕
FS1015	Deck Plate Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.180		✓ OK	Edit ✕
FS1020	Mild Steel Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.183		✓ OK	Edit ✕
FS1021	Blue Coil Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.198		✓ OK	Edit ✕
FS1025	Mild Steel Bales Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.180		✓ OK	Edit ✕
FS1026	Cone Sections Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.408		✓ OK	Edit ✕
FS1027	22kg Ingot Mould Scrap Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.592		✓ OK	Edit ✕
FS1030	NCM 15 Scrap Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.733		✓ OK	Edit ✕
FS1040	Cast Iron Brake Discs/Rotars Test stock — seeded 50,000 kg	Scrap	50000	0	50,000	\$0.204		✓ OK	Edit ✕
FS1041	TEMCO Ingot Moulds	Scrap	50000	0	50,000	\$0.204		✓ OK	Edit ✕

Core Heat Workflow — From Charge to Tap

1

Select Grade

Choose from 312 grades. Aim chemistry and per-grade returns rule badge appear immediately.

>

2

Enter Charge

Add scraps, returns, and alloys by code + weight. Live chemistry preview updates in real time.

>

3

Calculate

Auto + cost-optimised alloy recommendations. Per-element status: OK / Low / High colour-coded.

>

4

Trim Correction

After spectro sample, enter results. System finds cheapest trim additions to hit target.

>

5

Save & Report

Log the heat, print charge or trim report. Full spectro record stored for future review.



Charge Mix Optimiser

Linear programming finds the cheapest scrap combination

- ⚡ OPTIMISATION
- ⚡ Charge Mix Optimiser
- 🧠 ARTIFICIAL INTELLIGENCE
- 🧠 AI Metallurgist

🔥 269 scraps with stock available [Manage inventory →](#)

aim — minimising total material cost (scrap + alloys) while respecting inventory limits.

1

GRADE *
Q 066 — 86-30

2

TAP WEIGHT (KG) *
5000

3

TOLERANCE (±%)
Standard — ±15% of aim

4

RETURNS MINIMUM % (GRADE MAX FROM SPEC)
45 % min · Grade max: 60%

INVENTORY MODE
All materials in DB (unlimited) ✓
All materials in DB (unlimited)
Custom inventory (enter below)

⚡ Optimise

✓ Foundry Returns & Scrap Castings

3000 kg (60.0%) Rule: 45–60% 2 grade(s)

OPTIMISED TOTAL COST

\$2593.75

Scraps: \$390.54
Returns: \$577.37
Alloys: \$1625.84

2 scrap + 2 return types + 2 alloy corrections | Charge: 5195 kg → Tap: 4975 kg (~220 kg melt loss)

OPTIMAL SCRAP MIX				
MATERIAL	QTY (KG)	% OF CHARGE	\$/KG	COST (\$)
FS1025 Scrap Mild Steel Bales	1225	23.6%	\$0.180	\$220.41
FS1013 Scrap Slubs without Cast Iron	939	18.1%	\$0.181	\$170.13
013 Return 23C	2923	56.3%	\$0.180	\$527.26
180 Return 27Cr	77	1.5%	\$0.648	\$50.11
Total Charge		5195 kg charged (includes 220 kg melt loss)		\$967.91

CHEMISTRY AFTER MIX + ALLOYS				
ELEMENT	AIM %	FROM SCRAP %	FINAL %	STATUS
C	0.2800	0.2207	0.2195	✓
Si	0.4000	0.3235	0.3216	✓
Mn	0.8000	0.6680	0.6638	✓
Cr	0.5000	0.4095	0.4069	✓
Ni	0.5000	0.0000	0.4070	✓
Mo	0.2000	0.0000	0.1507	✓

ALLOY CORRECTIONS REQUIRED			2 additions
ADDITION	QTY (KG)	COST (\$)	
NI_RND Nickel Rounds (99.9%)	20.37 kg	\$325.92	
FEMO Ferro Molybdenum	11.32 kg	\$415.42	
Total alloys	31.69 kg	\$741.34	

Charge Mix Optimiser

Linear programming finds the cheapest scrap combination

aim — minimising total material cost (scrap + alloys) while respecting inventory limits.

269 scraps with stock available [Manage inventory](#)

- OPTIMISATION
 - Charge Mix Optimiser
- ARTIFICIAL INTELLIGENCE
 - AI Metallurgist

1

GRADE *
066 — 86-30

2

TAP WEIGHT (KG) *
5000

3

TOLERANCE (±%)
Standard — ±15% of aim

4

RETURNS MINIMUM % (GRADE MAX FROM SPEC)
45 % min · Grade max: 60%

INVENTORY MODE
All materials in DB (unlimited) ✓
All materials in DB (unlimited)
Custom inventory (enter below)

4

Optimise

✓ Foundry Returns & Scrap Castings

3000 kg (60.0%) Rule: 45–60% 2 grade(s)

OPTIMISED TOTAL COST
\$2593.75

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2 scrap + 2 return types + 2 alloy corrections | Charge: 5195 kg → Tap: 4975 kg (~220 kg melt loss)

AI REASONING

- Primary scrap: FS1025 — Mild Steel Bales (23.6% of charge). Cost: \$0.180/kg.
- High-value elements (Cr, Mo, Ni) drive scrap selection. LP maximises expensive alloying elements from scrap before using costly alloy additions.
- Alloy strategy: SiMn covers Mn+Si in one addition (\$2.98/kg vs HCMN+FESI) | All Cr via HCCR (\$4.64/kg) — cheaper than LCCR (\$7.44/kg)
- Tolerance setting: ±15% of aim (±aim×tol + 0.02%). Wider tolerance allows cheaper mixes.

Apply Full Charge Mix to Calculator

Will add 2 scrap(s) + 2 return(s) = 5195 kg charged → 4975 kg tap

Implementation — Lightweight & Flexible Deployment



Windows Desktop

Easiest

Python venv + Flask. Single command launch. No server needed. Runs on any foundry PC.



Linux Server

Recommended

Gunicorn + 4 workers. Serve the whole floor via local network. Zero client install.



PostgreSQL Backend

Enterprise

Optional Supabase/Postgres for multi-user, multi-shift write-heavy deployments.



Desktop App (.EXE)

Standalone

PyInstaller builds a single .exe. No Python install needed on end-user machines.

Thank You

Intelomelt

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- ✓ Charge Calculator + LP Optimiser — lowest cost every heat
- ✓ Trim Correction with 2% rebath alert
- ✓ Unlimited Grades can be managed
- ✓ AI Metallurgical Assistant — Ollama / Groq / Gemini / Anthropic
- ✓ Hardenability DI Calculator