ALUMINUM COMPONENT MANUFACTURING

Casting Machine Monitoring in Aluminum Component Manufacturing: Case Study

Making stable productive casting, cycle performance and hidden losses visible within a 147-machine production environment.



High-pressure die-casting equipment in aluminum component manufacturing.

147
Production machines

3 shifts
Modeled operating schedule

2006–2019
Machine generations

THE CHALLENGE

Where was productive casting capacity being lost?

Machine time could include slower cycles, idle periods, die changes, material or melt waiting, microstops, automation delays and downtime.

THE SOLUTION

One view of the existing die-casting process

Novo AI external retrofit sensors create a common machine-state and cycle view. WatchMen makes productive casting and hidden losses comparable over time.

RESULTS AT A GLANCE

+1,300.46 h
Additional productive capacity
Approximate annual 2-machine estimate

+25.87%
Productivity improvement
Customer-reported result

-34.72%
Less idle time
Modeled relative reduction

Quality remained the acceptance criterion. Higher productivity counted as an improvement only when specification-compliant castings were produced.

Figures combine the customer-reported +25.87% productivity result with clearly labeled model calculations. pp = percentage points.

THE PRODUCTION CHALLENGE

Stable casting requires more than a running machine

High-pressure die casting is cycle-based production. A machine can keep running while slower cycles, idle time, die changes, melt waiting, microstops and downtime reduce usable capacity.

58.0 s	60.0 s	+3.45%
Target cycle	**Average productive cycle**	**Cycle-time gap**
Modeled reference	Modeled baseline	Above target at baseline

The case-study model uses three 8-hour shifts across 250 production days: 6,000 scheduled hours per monitored die-casting machine and 12,000 hours across the two-machine monitored scope.

What became visible

Production question	Before monitoring	With WatchMen
Is the die-casting machine producing stable cycles?	Local observation / existing machine status	Validated cycle and machine-state timeline
How does actual cycle compare with target?	Not continuously compared in one view	Cycle deviation visible over time
How much time went to die changes and waiting?	Difficult to compare consistently	Comparable event durations and trends
What about short interruptions?	Microstops were easy to miss	Continuous visibility and history
Why did an order take longer?	Order context without physical timeline	Order context plus machine behavior
When should the team react?	Retrospective review	Configurable deviation alerts

Improve cycle performance

When the target is realistic, investigate cycle deviation, idle time, changeovers, melt waiting, microstops and machine behavior.

Check the planning assumption

When component, die, alloy, automation or quality limits performance, review the target and production master data.

Read the figures correctly: the +25.87% productivity improvement is the supplied project result. The cycle and time-loss figures below are modeled to create one consistent capacity scenario.

IMPLEMENTATION

One monitoring layer across die-casting machines

External Novo AI sensors create a common machine-state layer without PLC access. Edge processing and WatchMen make productive casting, cycle behavior, idle periods and recurring interruptions visible on existing equipment.



Novo AI retrofit sensor on existing production equipment.

<15 min

Installation benchmark per machine

No PLC or machine-control intervention.

01
Sense

External sensors capture physical machine behavior.

02
Interpret

Edge processing and validation support cycle and state detection.

03
Add context

WatchMen links machine states with order and production context.

From installation to operational use

Stage	Project milestone
Day 0	Sensors installed on the 2 monitored die-casting machines.
Days 1–3	Signal collection and initial cycle classification.
Weeks 1–2	Cycle, state and baseline validation.
Months 1–2	Loss reviews, improvement routines and onboarding.
Month 3	Evaluate results against the project baseline.

The sequence below illustrates the implementation path. The retrofit benchmark is under 15 minutes per machine; cycle and state validation establish the usable production baseline.

147-machine production environment

The broader production environment contains 147 machines. The detailed die-casting capacity model uses 2 monitored HPDC machines; machine generations span 2006–2019.

FINDINGS AND ACTIONS

Turn the timeline into a casting response

Monitoring supplies the machine evidence. The production team can then focus on recurring cycle and time losses and verify whether process changes release usable die-casting capacity.

01 Improve cycle performance

Modeled productive cycle time improves from 60.0 to 58.0 seconds, reaching the modeled target.

Response: Compare actual cycles with product- and die-specific targets, then investigate repeated deviations.

02 Reduce hidden idle time

Modeled idle time falls from 720 to 470 hours per machine/year, releasing 250 hours.

Response: Improve material readiness, next-order preparation and response to extended waiting.

03 Shorten die and product changeovers

Modeled changeover occupation falls from 600 to 460 hours per machine/year, a 23.33% reduction.

Response: Pre-stage dies, programs, tooling and supporting tasks before the machine becomes available.

04 Reduce melt waiting, downtime and microstops

Material/melt waiting falls from 420 to 310 hours, downtime from 360 to 305 hours and microstops from 240 to 195 hours per machine/year.

Response: Separate supply, technical and short-stop causes, then verify the same metrics after action.

Use comparable production conditions

Compare machines and orders with component family, die, alloy, cavity configuration, automation and quality requirements in view. More cycles alone do not establish better production.

A REPEATABLE IMPROVEMENT CYCLE

1 Measure
Record machine states and cycles.

2 Investigate
Review deviations and causes.

3 Act
Change the relevant process.

4 Verify
Compare the same metrics.

RESULTS

More scheduled time became productive

+1,300.46 h

Productive casting capacity per year

Approximate annual 2-machine estimate

The model annualizes additional productive casting capacity across the two monitored die-casting machines within the same scheduled time.

Loss category	Before	After	Time released
Idle / waiting	1,440 h	940 h	**500 h**
Die / product changeover	1,200 h	920 h	**280 h**
Material / melt waiting	840 h	620 h	**220 h**
Downtime	720 h	610 h	**110 h**
Microstops	480 h	390 h	**90 h**
Automation / quality + support	1,320 h	1,219.54 h	**100.46 h**
Total capacity released			1,300.46 h

The +1,300.46 h annual gain is the same released machine time shown in the loss categories below.

Where the additional productive capacity comes from

MODELED ANNUAL LOSS REDUCTION / 2 MONITORED DIE-CASTING MACHINES

Per machine / 8-hour shift	Before	After
Idle time	57.6 min	**37.6 min**
Die / product changeover	48.0 min	**36.8 min**
Material / melt waiting	33.6 min	**24.8 min**
Microstop time	19.2 min	**15.6 min**

Released loss hours and additional productive capacity describe the same time.

Keep the measures distinct

Productivity, productive-time share, cycle performance, OEE, casting output and quality are separate KPIs. Capacity gains and loss reductions describe the same released machine time.

APPLYING THE FINDINGS

What to review in your own die-casting production

Review machine behavior, cycle performance and production context together. Bring these inputs to a practical pilot review.

Bring to a pilot review	Why it matters
Machine and component groups	Compare similar machines, dies and component families.
Product- and die-specific cycle targets	Use realistic cycle targets for each component, tool and alloy.
Quality acceptance criteria	Define quality limits that any improvement must respect.
Order / die / material context	Connect machine, die, alloy and order context.
Shift and stop-reason context	Separate idle, changeover, melt waiting, automation delays and faults.

What the sensor can tell you

When machine behavior changed, when productive casting stopped, how cycle behavior changed and whether a pattern recurred.

What needs context

Why the event happened. Order, die, material, quality, automation, maintenance and operator context provide the cause.

A useful daily review

Review the largest loss, check the order, die and material context, agree an action, then compare the same KPI after the change.

CALCULATION BASIS AND KPI INTERPRETATION

Project inputs: 147 total production machines, a 3-machine pilot, 2 monitored HPDC machines, build years 2006–2019 and a customer-reported 25.87% productivity increase. Operating model: 3 × 8 h × 250 days = 6,000 scheduled hours per monitored machine, or 12,000 hours across the monitored scope. Productive casting rises from 3,000.0 to 3,650.23 h/machine while average productive cycle improves from 60.0 to 58.0 s. Together this yields output index 125.87 and +1,300.46 productive hours across two machines.

Annual hours and loss reductions are illustrative model outputs. The 147-machine figure describes the wider production environment and is not multiplied into the die-casting capacity model. OEE, utilization, cycle performance, output and quality are separate KPIs.

See what your die-casting machines actually deliver

Discuss your casting machines, recurring losses and a suitable pilot with Novo AI.

Request a WatchMen demo →