Livscykelkostnad som basis för ugnsutveckling

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AP&T´s metod att erövra ugnsmarknaden inom presshärdning

AUTOMATION · PRESSES · TOOLING

LINE CONCEPTS

- High-strength aluminum
- Press hardening
- Automation of tandem lines
- Heat exchanger plates
- Air duct parts
- Roof drainage

ENLIGHTEN AWARD 2017

QUALITY INNOVATION AWARD

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AUTOMATION

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PRESSES

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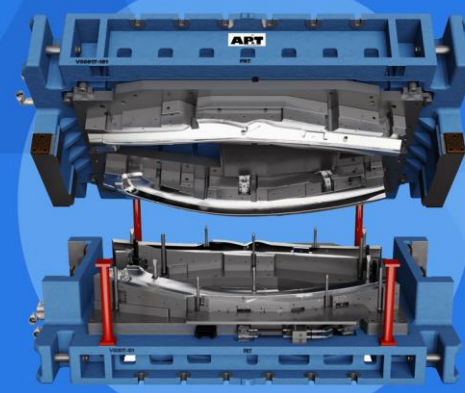
TOOLING



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MULTI-LAYER FURNACE

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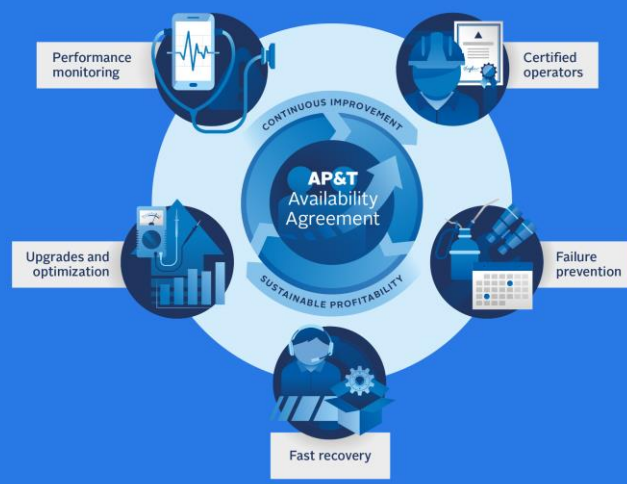
AFTERMARKET SERVICES



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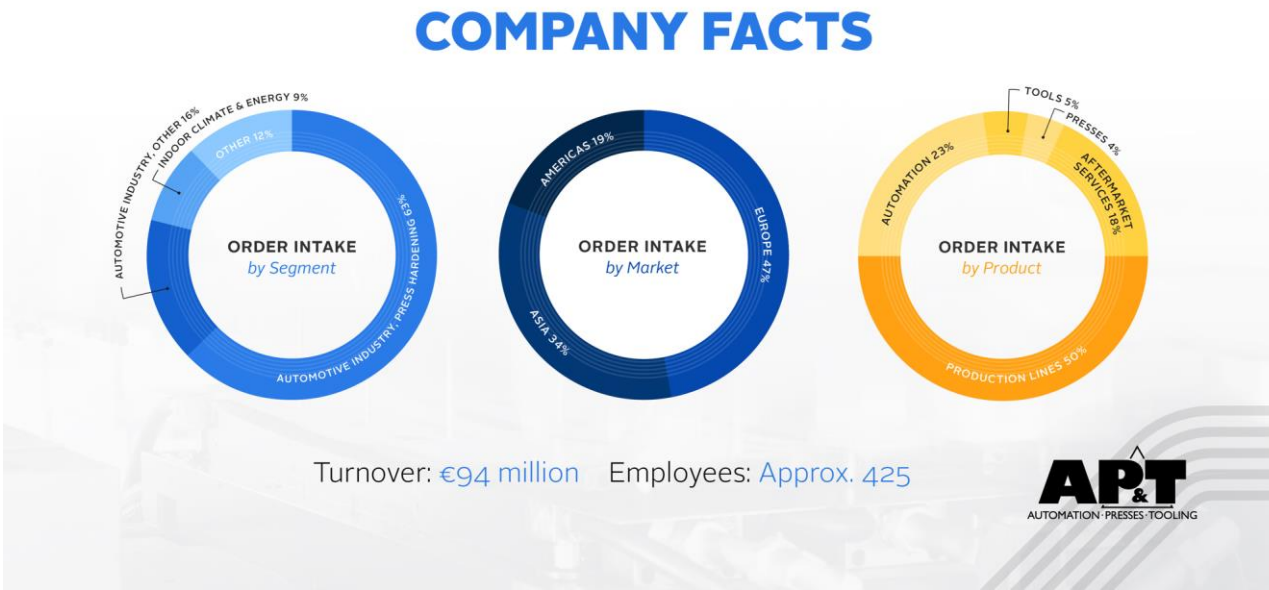

Abstract

The company AP&T started 50 years ago with hydraulic presses and automated goods handling. 16 years ago we delivered the first complete press hardening line and only 6 years ago commissioned our first PH-line equipped with a Multi-Layer-Furnaces (MLF) we designed and built ourselves. Today we are the global market leader in complete PH-lines with about 22% market share and have delivered over 60 units of 7-chamber MLF.

The success of the AP&T-technology is largely due to a 100% focus on the actual customer value throughout the life-time of the equipment – a clear vision of how the customer can make money with his investment and generate a pay back. By carefully analyzing and demonstrating the Total Cost of Ownership have we been able to compete successfully against equipment solutions that are significantly lower in purchase cost.

Asset ownership brings purchase costs but ownership also brings other costs :

- Installation,
- Commissioning, deployment
- Usage, operation, (manpower, energy, supplies, raw material, unplanned stops and brakes)
- Upgrading (technology maturity, development pace, changing requirements)
- Maintenance (manpower, spares, loss of production)

These after-purchase costs can be substantial. Consequently, for many kinds of assets, TCO analysis finds a very large difference between purchase price and total life cycle costs.

And, the difference can be especially large when ownership covers a long time period. As a result, TCO analysis sends a very strong message to corporate buyers, capital review groups, and asset managers. In this presentation the TCO concept is applied to heat treatment furnaces.

By considering weak spots in the competing solution, the roller hearth furnace, AP&T started a development process that eventually generated three generations of Multi Layer Furnaces which now present unsurpassed features and capabilities. A major step forward was taken with each generation of the MLF-concept and the advantages for the car body part suppliers could be increased.

The TCO ideas could well be applied every time you consider or evaluate equipment investments, not only ahead of purchasing decisions but also when considering upgrades, maintenance actions or comparison of different technologies. Especially in the heavy industry, where process equipment typically forms a major part of total assets, the analysis of the total cost of ownership is crucial for long term profitability.

Content

1. What is Total Cost of Ownership?
2. Hidden Costs of TCO
3. Calculation model for Equipment Performance
4. The AP&T furnace concept
5. How we influence TCO in the furnace design
6. The basic procedure in any customer case
7. Examples of design changes (improvements)
8. TCO as a source for product development ambitions
9. Conclusions

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Total Cost of Ownership (TCO)

TCO, the analysis meant to uncover all the lifetime costs that follow from owning certain kinds of assets. As a result, TCO is sometimes called *life cycle cost analysis*.

Consider TCO instead of purchase price when making purchase decisions!

Asset ownership brings purchase costs but ownership also brings costs :

- Installation,
- Commissioning, deployment
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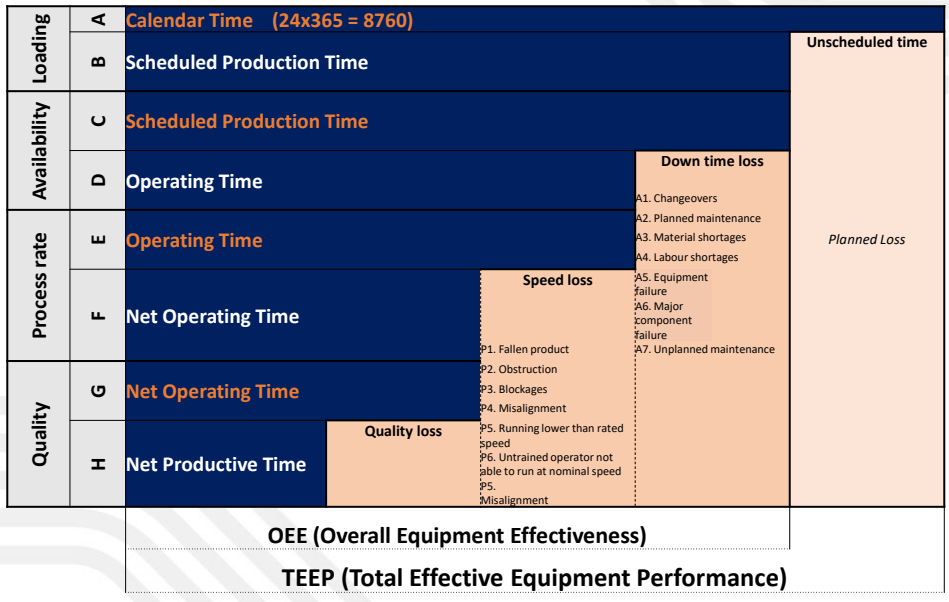
TCO analysis finds a very large difference between purchase price and total life cycle costs.

TCO analysis sends a very strong message to corporate buyers, capital review groups, and asset managers.

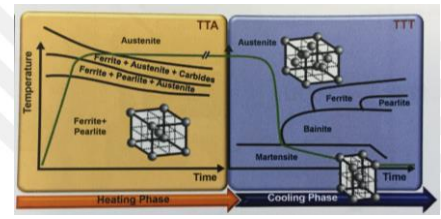
Calculation model for Equipment Performance

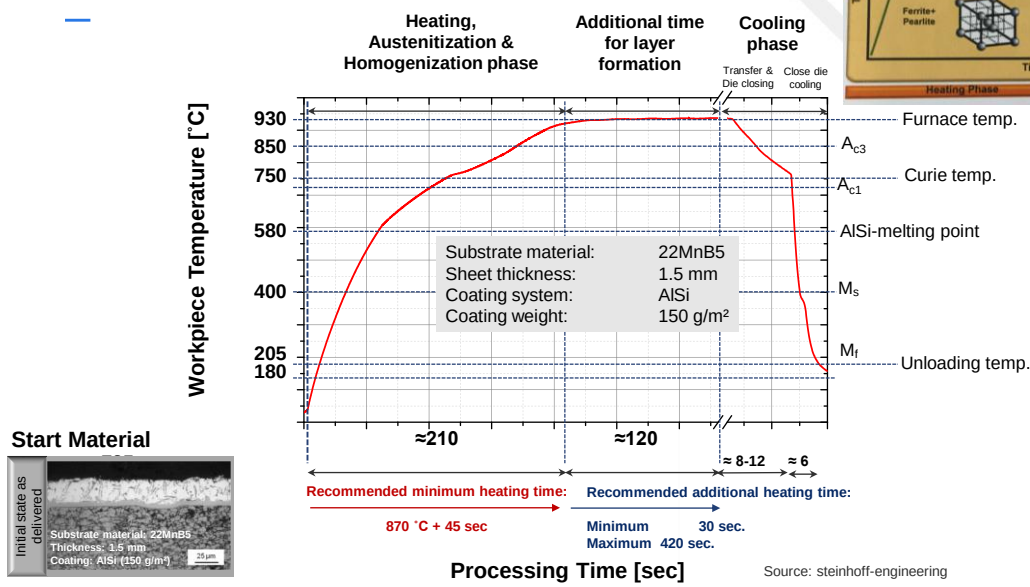


The AP&T furnace concept

PH-Performance

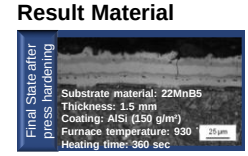
Heating curve, thermal process route





Source: steinhoff-engineering

Result Material



Start Material

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The past solution (the roller hearth furnace) was showing obvious short comings

RH

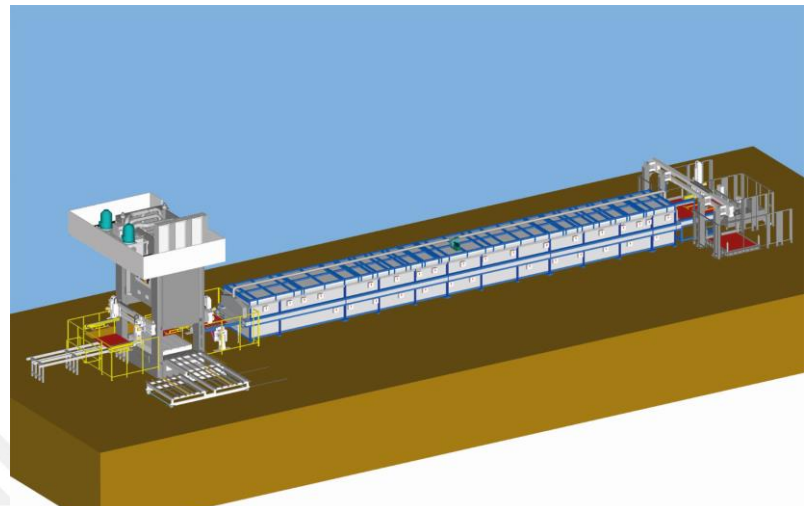
Cycle time improvement only through furnace extension (footprint)

Cladding of rollers causing frequent unplanned stops

Difficulty to exactly locate each blank after the furnace

Many moving parts in the hot environment demanded high maintenance level.

No redundancy. With every problem the whole line is stopped.



MLF

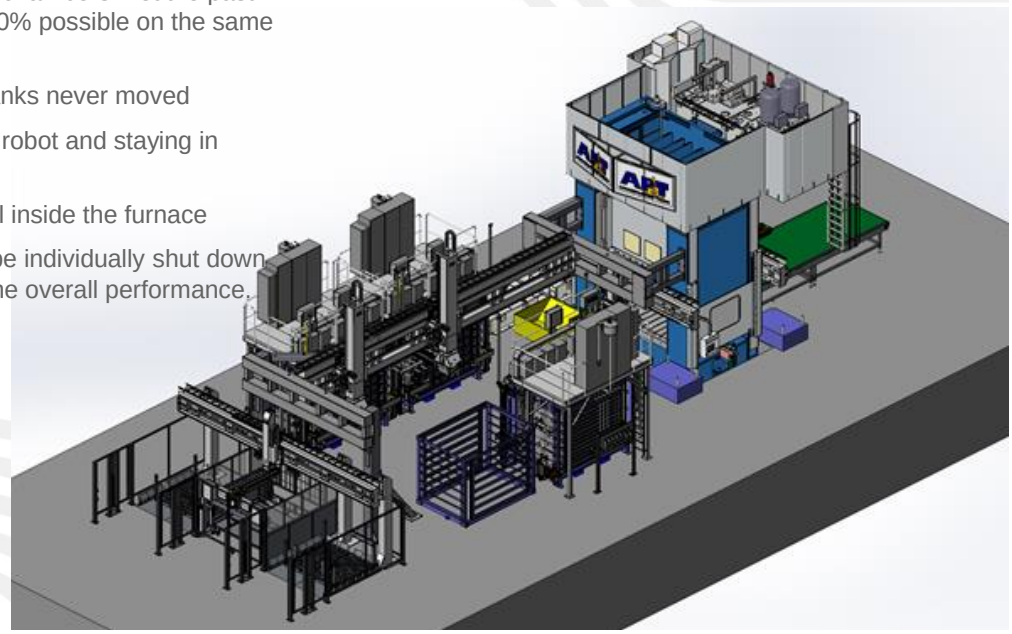
Already 3 stacks of 7 chambers met the past capacity. Additional 30% possible on the same footprint.

No cladding since blanks never moved

Blanks are placed by robot and staying in place.

No moving parts at all inside the furnace

3-4 chambers could be individually shut down without jeopardizing he overall performance.



Addressing market demand

Must-meet-criteria:

PH process

- Temp uniformity
- Dew point control
- Protective atmosphere
- Opex
- Energy
- Batch size (2100 x 1600 x 2)

Line integration/limitations

CQI-9

Competitive opportunities:

Floor space reduction

OEE

- Batch dislocation
- Wear and contamination on moving parts
- Complex change-over
- Unplanned maintenance

Cost of maintenance: spares, manpower

How we influenced TCO

Focus areas:

a. Forceful modularization
b. Extremely tight integration with handling equipment
c. Minimized heat losses (insulation, heat escapes)
d. Focus on cycle time, lead time, unused time
e. Reduced maintenance (wear parts, replaceability)
f. Assembly and FAT vs installation, commissioning and SAT
g. Scalability and redundancy of functions

With impact on:

a. Assembly cost, lead time, serviceability
b. Equipment capacity (cycle time), process criteria
c. Energy saving, process criteria
d. Equipment capacity (tons/h)
e. OEE, maintenance cost, spare part inventory
f. Ready at home, plug-and-play delivery
g. Flexibility in usage and expansion for a volatile market situation

The basic procedure in a customer case

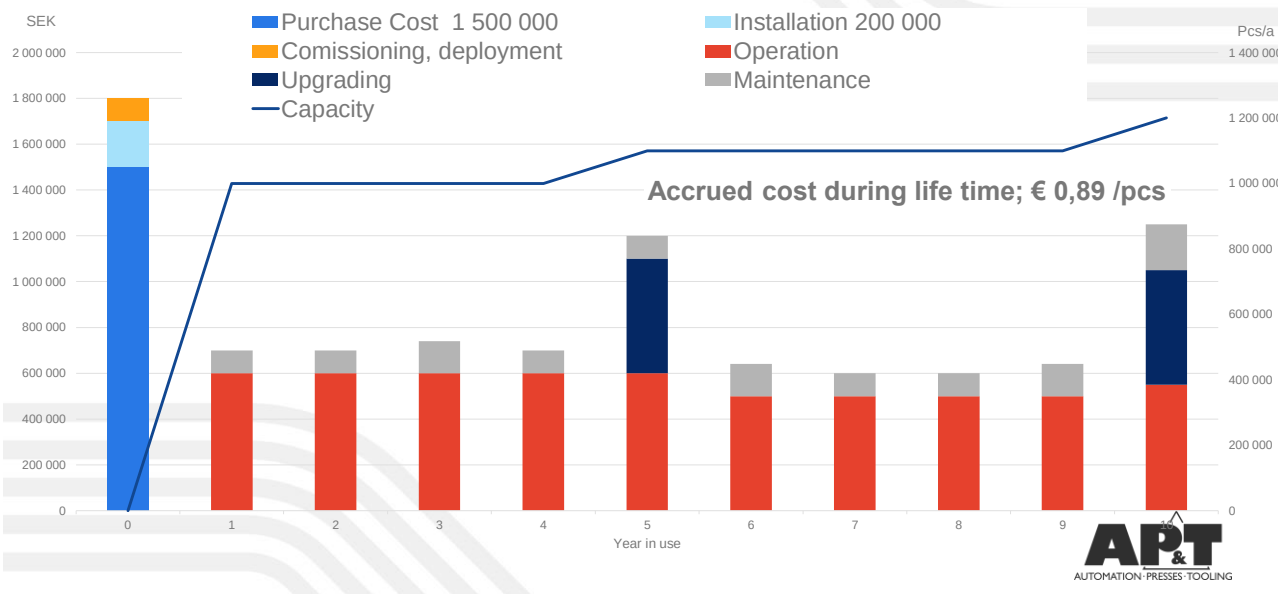
I. **Production scenario:** What products, how many, how often, batch sizes etc? What sellable products are expected to be produced? Generates revenues but also controls the material and energy demand and specifies other cost drivers.

II. **Collect customer data** on material, energy and labor cost; on holidays, lunch brakes and other labor related influence,

III. **Know your own equipment**: demand on service, spares and maintenance; output, cycle times, lead times; required energy, operator support, material utilization etc

IV. Prepare the **detailed spread sheet** and start calculating.

Example of TCO displayed over the years of service.



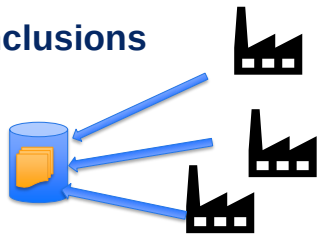
Examples of design changes (improvements)

Objective	Solution	Improvement
Increase heating element service life	Change supplier Protect against feeder collision Thyristor firmware Element layout Element connections	From < 1 year to < 2 years.
Reach tighter temperature uniformity, reduce heat loss	Revision of insulation Elimination of cold bridges Element layout	+/-15 °C (CQI-9) reduced to +/- 8 °C
Dew point control improvement	Revised flow scheme Single chamber control	- 5 °C maximum to -15 °C, if requested
Increase OEE	Element replacement in hot furnace	1 week maintenance stop -> 1 hour
Enable tailored tempering	Acquire patented solution. Design an integrated TemperBox®	Hard and soft zones at retained cycle times

TCO as a source for product development ambitions - or the source for investment decisions?

Product development	Investment criteria
How can we influence OEE? [%]	What OEE should we expect?
How can we increase capacity [units p.a.]	How does capacity impact pay back?
What would reduce energy consumption? [kW]	What energy supply is needed? What energy source is favorable?
How can we produce to tighter quality requirements? [+/- tolerances]	How can we benefit from product quality?
Can we cut cost along the supply chain?	Is this the optimal process chain
How do we make maintenance predictable and efficient? [$$]	What annual maintenance is needed, at what efforts?
How do we enable upgrades and reconditioning?	How do we ensure long term utilization and competitiveness?

Conclusions



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BTW, Currently looking to hire personnel in furnace development and design. Get in touch!