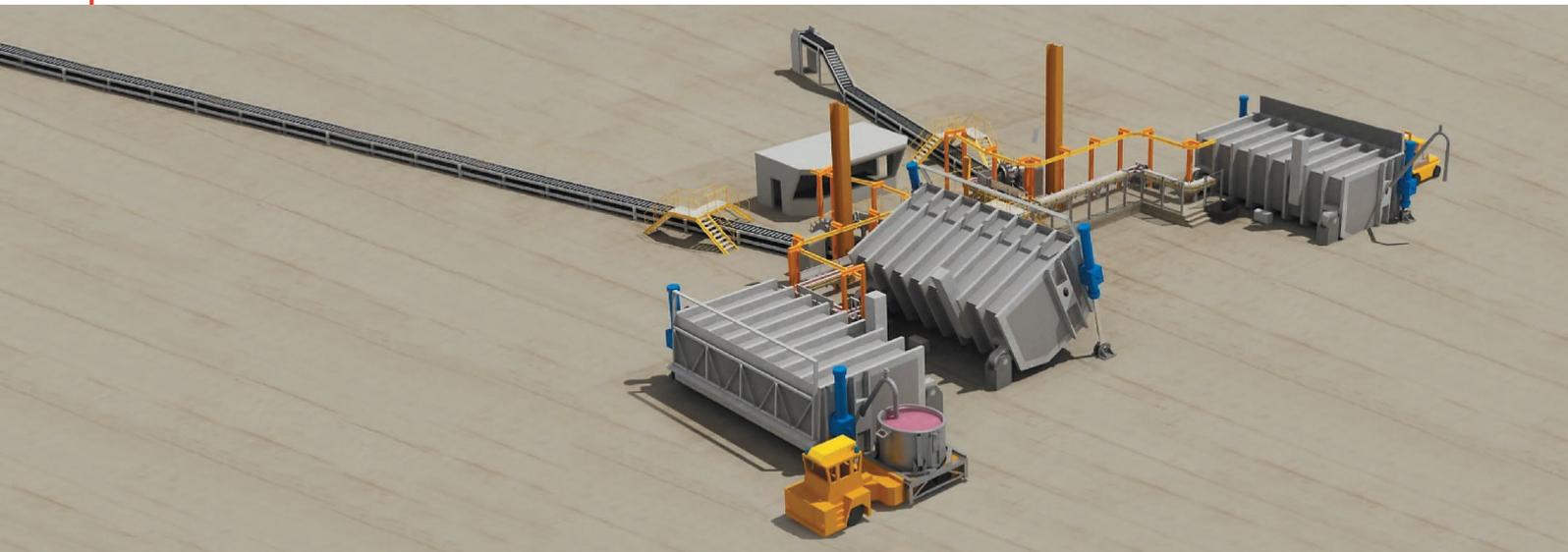


AP Technology™

Innovative Compact Casthouse Design Efficient, flexible and safe



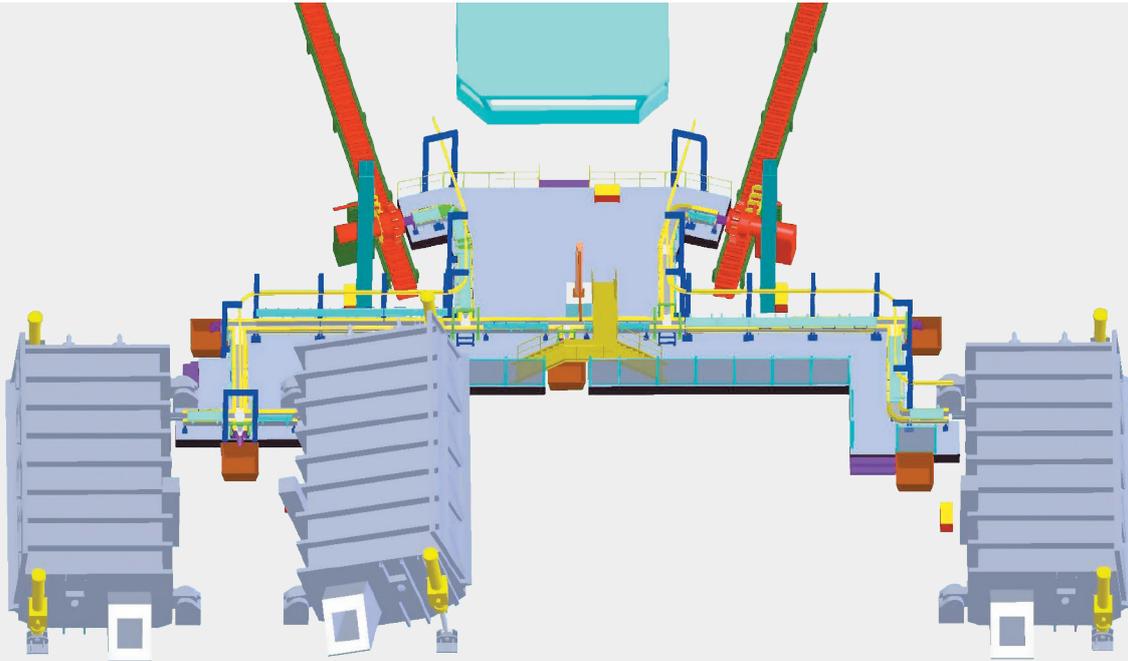
Compact design

Our next generation casthouse design

Rio Tinto Alcan's AP Technology™ delivers the industry's most comprehensive smelter package, combining leading edge AP Technology™ with a century of aluminium production experience.

One key component of this package is our innovative compact ingot casthouse design. It incorporates best practices, modern instrumentation and a clever layout to deliver a low cost, efficient and safer to operate ingot casthouse.

**Our innovative solution
delivers a low cost, efficient
and safer to operate ingot
casthouse.**



*Innovative,
economical layout*

Our AP Technology™ compact ingot casting package stands out from the competition as a result of its:

- Simplified layout design
- High operating time availability and productivity
- Optimised cost lowering both the initial investment and operating costs
- Rio Tinto Alcan's high health and safety standards and environmental efficiency embedded in the design

Key features of our AP Technology™ compact ingot casthouse package

- An innovative compact layout developed through extensive modelling based on years of operational experience incorporates all possible parameters and conditions found in a casthouse including breakdown and maintenance modes. The resulting layout allows the same level of production with one fewer casting furnace, significantly lowering investment and operating costs.
- Metal transfer into the furnaces is performed with minimum metal turbulences, resulting in very low melt losses.
- A furnace design incorporating an effective sealing concept and high efficiency burner and pressure controls provides our customers with low energy consumption per tonne produced.

An innovative design

The layout of aluminium casthouses has important consequences in the areas of safety, investment and operating costs. Traditional solutions for casthouses producing non-alloyed ingots use two furnaces per ingot casting line.

Our innovative AP Technology™ layout uses three furnaces for two ingot lines ('trio' layout) rather than two separate ingot lines each connected to two furnaces ('pair' arrangement). This new layout is being deployed at our Kitimat aluminium smelter in British Columbia, Canada.

This unique configuration offers a superior full economic cost and is now part of our AP Technology™ basic engineering package.

Low operating cost and high performance

Low melt loss

The compact design ensures very low melt loss by optimising metal transportation and transfer. Integrating siphoning rather than pouring along with an efficient furnace design reduces metal turbulence and oxidation to a minimum.

Benchmark melt loss levels of 0.3 per cent or less have been achieved.

Pouring metal for low melt loss



High energy efficiency

Energy consumption is a key process indicator of a well-designed and operated casthouse. Best practices developed in recent years at Rio Tinto Alcan casthouses are integrated into a high efficiency technology package with features such as:

- Optimised burner power to furnace capacity ratio
- Efficient pressure control and monitoring
- Superior furnace sealing to avoid air infiltration

High productivity/low OPEX

Using modern modelling tools, the casthouse configuration is designed to ensure maximum productivity and equipment utilisation rates.

Automated and safe work environment



Metal flow modelling

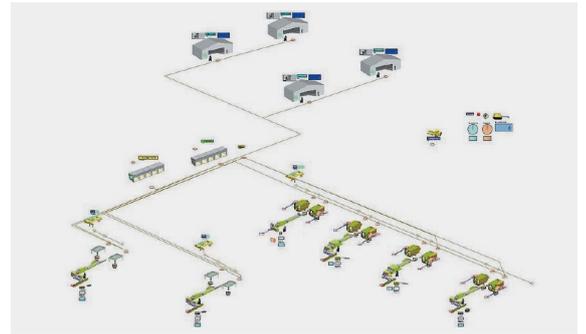
The design of our casthouses is based on a complete modelling of the metal flow, from pot tapping and metal transfer to furnaces, furnace preparation, casting parameters and superpack packaging and formation ready for shipment.

The model integrates numerous parameters including:

- Maintenance performance – mean time between failures (MTBF) and mean time to repair (MTTR) – of all equipment, from pot tending machines to ingot packaging
- Distance in and between shops
- Duration of each operation
- Sequencing of operations
- Process values such as targeted casting temperature range, metal cooling rate in the ladles and furnaces, and rejection rate

The casthouse is then modelled in various modes.

- Normal mode with all equipment available (breakdowns and short maintenance periods taken into account)
- Downgraded mode (long term maintenance on an ingot line or furnace)



AP Technology™ compact ingot casting technology is flexible and available both for new smelters as well as existing facilities seeking to increase capacity or improve performance.

End-to-end casthouse services

Our AP Technology™ engineering capabilities cover a broad range of casthouse customer needs from potroom metal delivery to product shipment including:

- Pre-feasibility studies
- Metal flow modelling and casthouse layout simulations
- Basic engineering
- Equipment selection
- Technical support during construction, commissioning and operation
- Training at our Institut Paul Héroult



**Manufacturing Execution System (MESAL™):
the brain of your smelter**

Our AP Technology™ compact ingot casthouse can be linked to our Manufacturing Execution System (MESAL™) for optimum integration of operations, planning, stock management, expediting and reporting.

Casthouse dashboard

MESAL™ provides IT tools, functions, screens and reports for smelters.

- Production follow-up
- Continuous improvement KPIs
- Optimised stock management

Major MESAL™ deployments for casthouses

Today MESAL™ is delivering significant benefits at five sites worldwide and counting.

- In 2006 the complete MESAL™ solution was implemented at the Sohar Aluminium smelter in Oman and in November 2012 we deployed a major release, MESAL™ 2.0.
- From 2011 to 2012 MESAL™ Casthouse MES specific functions were deployed at the Aluminium Dunkerque smelter in France to replace the legacy casthouse system managing all operations and processes to deliver value added products. In the second quarter of 2013 these specific functions were deployed at the Alma and Laterrière smelters in Quebec.
- In 2014 MESAL™ 4.0, the latest major release, is being deployed at the Kitimat aluminium smelter in British Columbia, Canada, embedding Operational Excellence enhancements and covering all aluminium smelter workshops.

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