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## AP Technology™ Exceptional value delivery worldwide

## A GREAT MILESTONE **10,000** pots IN OPERATION WORLDWIDE

## RioTinto

## Kitimat Start-up is under way

Kitimat plant

In British Columbia, Kitimat's new 384-pot potline, installed in four separate rooms and showcasing the latest AP40 technology, tapped its first metal the 28 June 2015. Since then, pots have been started safely and smoothly, using AP Technology™'s new patented dry start-up methodology for the first time at this scale.

#### More flexible operations

The dry start-up dramatically changes the layout of the start-up area by significantly reducing the activities performed on a starting pot. With less equipment time needed, this method brings more flexibility to the operation as it frees some equipment availability which is crucial during a smelter start-up when all systems and organisations are geared up to reach full capacity.

On the carbon side, the new anode baking furnace is now fully operational after a flawless dry-out and ramp-up in the second half of 2015.

Kitimat will reach full capacity in 2016. We wish them a safe and successful start-up!

## Hindalco Mahan smelter fully operational



Mahan: Start-up of the 360th pot

On the 28 August 2015, Hindalco Industries Limited successfully started the 360th and last pot of the potline at its Mahan smelter in Madhya Pradesh, India. The event marked a significant milestone for the aluminum industry in India.

With its 360 pots using AP36 technology, Mahan produces approximately 360,000 tonnes of aluminum per year and is powered by a captive power station of 900MW.

Its sister plant, the Aditya smelter in Odisha, India, is currently ramping up, with a target to reach full capacity in Q1 2016.

## Editorial Innovating and ramping up



Vincent Christ Vice president, Technology & Project Development

On 23 June 2015, the first AP40 pot was started at the Rio Tinto Aluminium Kitimat Modernization Project (KMP). Since then, the ramp-up has been progressing rapidly to reach 250 pots in operation by early January 2016. KMP's new Compact High Productivity Casthouse for small ingots production is also delivering the expected performance.

Equipping KMP with the latest AP Technology™ products – ALPSYS and MESAL – is bringing important functionality innovations. The result is increased productivity for both start-up and operations. The current focus at KMP is on the continued safe and sustainable ramp-up to full production.

#### Reaching expected performance

Both the AP60 technology platform installed at the Arvida Technological Centre in Jonquière, Canada, and the APXe low energy version operating at the Laboratoire de Recherche des Fabrications (LRF) in France, continue to demonstrate their capacity to reach expected performance: a landmark daily production of more than 4,450 kg Al/pot/day for AP60 and a specific energy consumption of less than 12.0MWh/t at amperage above 500kA for APXe. Also at Arvida, the fully automated anode change operations demonstration in the industrial potline environment is progressing well.

#### A focus on customers and the future

2015 was another challenging year for the aluminium industry. The AP Technology<sup>™</sup> team continued to support global customers by delivering advanced solutions to optimise their existing operations and drive performance in line with their technology and site potential for amperage creep or energy reduction.

We also kept an unwavering focus on the future, going beyond incremental improvements towards the Smelter of the Future, a step change that will take place in the not so distant future.

In December 2015, the 10,000th high amperage AP Technology™ pot was put into operation following 30 years of successful implementation of AP18, AP30 and AP60 technologies. On behalf of the entire AP Technology™ team, I want to thank all of our customers for their longstanding support that has led to this remarkable milestone.

I hope you enjoy reading our AP Technology™ news and updates.



Alma plant

## Alma

15 years old and still ahead

## At Alma in Quebec, Canada, the 432 AP30 pots started 15 years ago are still a production benchmark.

With the AP40 lining implementation in recent years, Alma is now fully converted to AP40 and, since mid-2015, has been operating above 400kA. In July 2015, five AP44 trial pots were started in a boosted section at 440kA. They pave the way for future amperage increases on the AP30 platform.

With this new AP Technology<sup>™</sup> brick available soon, we'll have more solutions to support pot amperage creeping projects.

# R&D cooperation agreement with NALCO



On 10 July 2015, we signed an R&D Cooperation Agreement with National Aluminium Company Limited (NALCO). The agreement marks a major milestone for our two companies. It enables us to join forces to advance alumina refining and aluminium reduction technologies through various developmental research activities.

The agreement was signed between Dr. B.K. Satpathy, Executive Director (Business Development), NALCO, and Bernard Allais, Director (Sales and Marketing), AP Smelter Technology, in the presence of senior NALCO officials.

## Tomago Aluminium 250kA and increasing

Since its inception in the early '80s, Tomago Aluminium, located in New South Wales, Australia, has remained at the forefront of smelting productivity and efficiency.

At the time of first production, it was the world's first large-scale AP18 plant with two potlines of 240 pots each and an annual production capacity of about 240,000 tonnes.

In 1991, a third potline and other facilities were added. Operational in early 1993, the expansion project increased the plant's annual output by 140,000 tonnes.

Stage 2 of this project extended potlines 1 and 2 and was completed in December 1998.

#### Achieving 580,000tpa

In 2001, Tomago Aluminium started converting its original AP18 technology to AP22. Pots were reengineered to run at greater capacity and bring the smelter's output to 530,000 tonnes annually.

In 2009, Tomago Aluminium launched the next phase of its creeping programme, upgrading the AP22 pots to AP24, the latest AP Technology<sup>™</sup> design.

Seven years later, Tomago's 840 pots are now successfully operating at 250kA – a massive 40 per cent increase compared to the original AP18 amperage – with a production capacity of 580,000tpa.

While ensuring energy efficiency and environmental performance, Tomago Aluminium continues to work on developments and improvements to push its robust AP18 technology to its limits.

## AP60 Jonquière Paving the way for operation at 640kA

At the Jonquière smelter in Quebec, Canada, all of the AP60 pots started in 2013 are operating smoothly above their target amperage and achieving benchmark fluoride emissions. In 2015, Rio Tinto started planning for the future by launching the AP64 R&D program. Our objective is to push the AP60 platform to 640kA while the technical team is currently developing safe and robust operation at 600kA.

Developed in parallel with AP44, the AP64 program will use similar technology bricks, demonstrating our ability to implement them in a robust way on various pot technologies.

## Alouette

On the low-energy route

The conversion of Alouette in Quebec, Canada, to AP40LE low-energy technology is progressing very well. At the end of 2015, more than 540 out of 594 pots had been converted to 'Alouette AP40LE'. All 594 pots will be fully converted in 2016.

The converted pots' energy consumption is 12.85MWh/t at 380kA with a pot productivity of 2.83t/day.

#### Reaching AP40LE's full potential

Following full conversion to AP40LE, the plant expects to reach the following performance which was achieved on a booster section running at higher amperage: energy consumption of 12.80MWh/t at 395kA with a pot productivity of 2.89t/day.



This performance also includes outstanding features such as:

- Very low ACD operationStandard anode size
- Long potlining life
- Stable operations

These results make Alouette the undisputed benchmark in operational excellence on the journey toward low-energy smelting.





# AP Technology<sup>™</sup> is proud to introduce APXe technology

The very low-energy smelting solution for the aluminium industry

APXe is the latest high productivity technology developed by Rio Tinto and AP Technology™.

APXe combines:

- Very high productivity (500,000 amps) 1,370 tonnes per pot per year, 10 to 15 per cent higher than previous technologies
- Very low specific energy consumption less than 12,200kWh/t Al, about 800kWh/t less than previous technologies which means that a given power block can produce seven per cent more aluminium

#### The APXe smelter

The APXe aluminium smelter delivers its nominal capacity on a typical layout of only 65ha for 500,000tpa with a very limited environmental footprint. It embeds the best and latest technologies available and is the benchmark for fluoride emissions and greenhouse gas emissions.

# Helping you reduce your energy bill

In our industry, energy consumption is a key performance factor for a smelter as energy costs can represent up to one-third of the overall production costs. With LME prices at historical lows, reducing the amount of energy to produce each tonne of metal is a smart move for our planet and your smelter.

Thanks to more than ten years of continuous development and validation of innovative solutions to reduce pot energy consumption, we can design and implement the solution that will meet your needs and reduce your energy consumption – whatever technology platform (AP Technology<sup>™</sup> or others) you use, with or and without additional CAPEX.

## Carbon robustness

High anode quality is a must to ensure a robust pot operation. Even more so on modern pots using the latest developments which require anodes of a quality consistently within specifications.

For years, AP Technology<sup>™</sup> has been committed to improving anode quality and reducing its variation to ramp up the carbon robustness of the anode manufacturing process. Carbon dust crises and anodic incidents in reduction will soon become issues of the past.

Two main indicators are used to assess anode quality: permeability and resistivity.

#### Permeability

Permeability may be drastically improved by online green anode binder control. The binder is the mix of pitch and ultrafine grains that make coke grains stick together. Anode permeability is closely correlated to the binder content. New developments lead to an integrated binder control versus the traditional dual pitch and fine grain controls. At our Alma smelter, these developments are delivering:

- · Higher anode density
- · Reduced anode density variation
- · Lower anode height variation

#### Resistivity

The first way to improve anode resistivity and reduce its variation is to ensure a good anode baking process. To address this key point, we've developed the Anode



Baking Furnace baffleless design to improve the baking level homogeneity (see article on page 8). Over the years, we've also fine-tuned the traditional with-baffle design to improve anode baking homogeneity.

In smelters today, only three out of one thousand anodes are generally checked for their resistivity. This situation impedes the proper detection of the outof-range anodes that create most of the pots' anodic incidents. In collaboration with ECL<sup>™</sup> and Alouette, we've developed MIREA. This equipment measures the voltage drop profile of each anode to identify defaults and cracks as well as provide an image of the baking level. The equipment is fully integrated into the anode production line.

## Full anode production traceability: when a dream comes true.

MIREA enables the full traceability of anode production from the paste plant to the pot. Now operations can connect individual green and baked anode data with the pots' anode behaviour and performance. This allows you to better understand and anticipate anode process deviations. It also clears the way for smelters to leverage the full potential of the latest pot developments.

# Regaining operational robustness in our smelters

Today more than ever, we're all focused on increasing smelters' performance to reduce production costs. Whatever the solution we choose to implement, they all have one thing in common: they trade off robustness against efficiency. This could mean:

- · Less manpower to lower operational costs
- Less anode cathode distance to increase production or reduce power consumption
- Less measurements or reduced maintenance to cut costs... and so on.

While most plants all have ongoing action plans to address efficiency, what are we doing to manage the resulting loss of robustness in our operations?

## Regaining operational robustness in our smelters (cont'd)

#### Highly robust solutions

As part of Rio Tinto's AP Technology™ approach, we've developed solutions to regain our operational robustness while continuing to take steps to improve efficiency. These solutions include:

- Smarter information systems like MESAL, our MES solution, and RADAR, our reduction data analysis tool
- Comprehensive technical training programmes delivered by our IPH Training Institute to strengthen employees' technical skills
- ALPSYS innovations
- Anode robustness

## We can support plants in developping the robustness needed to fully benefit from cost-reduction actions.

# ABF baffleless design

In the early 2000s, our Laboratoire de Recherche des Fabrications (LRF) in Saint-Jean-de-Maurienne, France, launched a project to redefine fluewall design. Their goal was to improve the fluewall's safety and process performance. When researchers decided to remove the baffles, they embarked on a lengthy and challenging development process that involved testing several different designs in anode baking furnaces around the world.

Pitfalls encountered during the trials were addressed and successfully resolved. Baffleless furnaces erected at Tomago (Australia) in 2008 and Qatalum (Qatar) in 2009 continue to meet initial development targets.

#### **Design and performance improvements**

Based on the success of these two furnaces, we're now delivering the following design and performance using baffleless fluewall technology:

- A blockage-proof design
- A 5 per cent lighter fluewall with some 25 fire cycles extra-lifetime expectancy

Gas velocity in different fluewall designs (m.s<sup>-1</sup>) through finite element modelling



## ALPSYS news

## ALPSYS @ ALBA

After launching the ALPSYS upgrade of Lines 5, 4 and 3 in 2012 and 2013, the ALBA smelter in Bahrain decided to also upgrade its Lines 1 and 2 process control system in 2014.

By December 2015, Lines 5, 4, 3 and 2 were fully switched over to ALPSYS. Line 1 will be switched over in early 2016. This means that ALBA will operate all its potlines, using three different pot technologies, with the same ALPSYS process control system including the RADAR Process intelligence function.

Thanks to the excellent teamwork of all involved, ALBA switched over its potlines in record time.

ALPSYS will improve ALBA's ability to control the pots while enhancing pot performance and efficiency. It will also generate synergies by standardising procedures and KPIs as well as technical training on process control across the entire plant, despite the differences between the five potlines.

- Lower fuel consumption (typically 0.2GJ/t or 10 per cent)
- Better baking homogeneity (pit  $\sigma$ Lc < 1.5Å) for better anode robustness on pots
- A low-cost solution to reduce fluewall width in anode size-creeping projects
- Reduced CAPEX for a greenfield anode baking furnace and its fume treatment centre

#### Lower CAPEX and OPEX

These improvements translate into significant CAPEX and OPEX savings as well as enhanced performance compared to traditional fluewall designs. These gains are achievable either when retrofitting an existing ABF or building a new ABF.

Our baffleless fluewall design can be implemented on any type of anode baking furnace even during the normal fluewall replacement without production loss.

## ALPSYS news

#### ALPSYS V15.1 on its way



After more than 16 years of service, the time has come to say goodbye to the ageing ALPSYS Level 2 graphical human interface. After introducing RADAR in 2013, the next phase of a full pot control system overhaul began last summer. It will provide Dunkerque with a new set of interface functions focusing on workshop process control activities.

Full potline synoptics, on-demand conditional potline group configuration, process control supervision, monitoring worksheets: this project isn't just about renovating existing Level 2 screens. It also offers an excellent opportunity to create new functions that will deliver more value on the shop floor.

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## ALPSYS @ Tomago

Who said that replacing level 1 hardware and software in a potline requires heavy construction activities?

After successfully converting 60 pots at Tomago to the latest ALPSYS Level 1 by just changing the potmicros (with no impact on the electrical cabinets), full conversion of Lines 2 and 3 is on its way.

## 2015/2016: Busy times!

The ALPSYS team has been busy! In July 2015, Aluminium Dunkerque in France began overhauling its 25-year-old pot control system. In October, Alma in Quebec launched a project to upgrade its ALPSYS Level 2, first implemented in 2000. Then in December, Tomago in Australia decided to complete the renewal of its Lines 2 and 3 potmicros.

Upon completion, these three new projects will mark a new milestone for us: 10,000 pots equipped with ALPSYS around the world!

As 2016 starts, the list of sites benefitting from our maintenance, support and evolution services continues to grow. With the addition of three new plants under maintenance, the ALPSYS family has now reached 14 members!

## ALPSYS @ Kitimat

At the Kitimat smelter in British Columbia, Canada, 2015 was the year of the ramp-up. It was also the year that ALPSYS went wireless. Kitimat both ramped up its new AP40 potline and successfully started up its portable ALPSYS interface.

The two major ALPSYS innovations implemented at Kitimat enable most of the pot operations procedures to be initiated remotely. This is done either from the PTA remote control user interface or from the portable ALPSYS interface using the potline WiFi network.

Kitimat can now operate and monitor pots in real time without the need to go to the potmicro. This marks both a big change in the way of working on a potline and a first step towards mobility, an essential part of future ALPSYS developments.



## MESAL<sup>™</sup> RBCM Reduction Bath Cycle Management

#### In today's challenging environment, reducing the amount of bath carried over with metal during siphoning operations is a way to improve metal quality and reduce costs.



Treating one tonne of bath costs a smelter approximately US\$250. The commonly accepted benchmark is 5kg of bath per tonne of aluminium. Poor control of bath quantity in crucibles, for instance having up to 25kg/tonne, results in an annual loss of \$1.25 million for a smelter producing 250,000 tonnes of aluminium per year.

To reduce the amount of tapped bath, we've developed a new module within the MESAL<sup>™</sup> Aluminium framework: MESAL<sup>™</sup> RBCM for Reduction Bath Cycle Management.

#### Full visibility

MESAL<sup>™</sup> RBCM allows you to calculate a KPI in kg(bath)/t(alu) based on bath recovered in the skimming station and crucible cleaning shop. The MESAL<sup>™</sup> traceability module (TRAC) lets you fully track each shuttle as well as gather, store and calculate all relevant data. The relevant KPIs are then shown in both the reduction and casthouse shift log (SLOG) dedicated dashboard. Users can also view the Pareto of possible causes of abnormal situations.

MESAL™ RBCM: Reduction Bath Cycle Management, the right tool to control bath in tapped liquid metal





## Driving improvements with MESAL<sup>™</sup> 4.0

Time to Market: MESAL™ product updates strategy Rio Tinto best practices incorporated within MESAL<sup>m</sup> 4.0 are rapidly distributed across all the plants using MESAL<sup>m</sup> to ensure they quickly benefit from these improvements.

Whenever a software improvement is developed by our Technology and R&D teams or at a plant's request, we immediately make it available to all MESAL<sup>™</sup> sites.

Local IS&T resources adjust the parameters to the site's specificity and validate the improvement in their local MESAL™ environment with their production teams. They then activate the new feature in the MESAL™ production system and train the operators.

#### It's that simple and fast.

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## MESAL<sup>™</sup> 4.0 up and running at Kitimat

MESAL<sup>™</sup> 4.0 is now fully operational and covering all sectors at the Kitimat smelter.

MESAL<sup>™</sup> solution for Kitimat: A key innovation supporting the smelter ramp-up The Operational Excellence functions in the reduction and carbon areas help operations teams identify savings to continuously improve productivity in the various plant shops.

The plant's TOP 10 KPIs and TOP 100 KPIs are accessible through the MESAL<sup>™</sup> Mobile App. This new MESAL<sup>™</sup> 4.0 enhancement runs on Android and IOS devices and uses WiFi and 3G/4G capabilities.

During the ramp-up phase, the dashboard functionalities allowed real-time tracking of progress in reaching the smelter's full potential. High solution flexibility also enables local teams to quickly design and customise new dashboards across the smelter.





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Consumption of packing	40,00 kg/t
Quantity of sodium in the	200 ppre
Gross case. of anodes that	543 kg/t
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Fuel consumption by the	2.09 Gjn
Quantity of dust in the	9,00 mg/Nm3
Temp. at inlet of filters	37 19,611
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## MESAL<sup>™</sup> Mobile App: View KPIs anywhere, anytime

## MESAL<sup>™</sup> Mobile App offers a single point of access to your plant's KPI repository for a global view of your production and operations.

A universal connector allows the app to receive information from all your existing applications using an XML interface. The MESAL<sup>™</sup> Mobile App can be used as a central point of access to your plant's various KPIs through local WiFi infrastructure or 3G/4G access.

You can also benefit from the MESAL<sup>™</sup> Mobile App even if you aren't using a MESAL<sup>™</sup> system in your plant.

MESAL<sup>™</sup> Mobile App displays key indicators, with targets and messages, coming from all the IT components in your Information System. The app also supports HTML5 standard and exists in native format for IOS and Android devices.

MESAL™ Mobile App: A single tool to access all enterprise KPIs



## AP Technology™ Smelter of the Future

The AP Technology<sup>™</sup> smelter is the result of a long journey of continuous improvement in environmental performance, energy consumption, productivity and working conditions. Yet there is always room for further improvement. The AP Technology<sup>™</sup> Smelter of the Future represents a step change in aluminium smelting – an automated plant built around a new cell generation designed for automated operation.



#### The new cell

- This groundbreaking cell design combines super high amperage with very low energy consumption (11 - 11.5kWh/kg). The cell can be operated in a fully automated mode.
- These improvements result in a compact layout and high productivity – more than 900 tonnes per employee per year.
- The process and cell design also reduce fluoride emissions to a new benchmark level.

## Improved working conditions through automation

## In the AP Technology<sup>™</sup> Smelter of the Future, operator exposure to risk is eliminated for most routine operations.

To enable automation, the new cell incorporates several innovations. For example, BAC (fully automated anode change) and MAX<sup>™</sup> (autonomous heavy load transport) are now in the pilot test phase under real conditions in our smelters.



BAC: The best in class anode change solution in a fully automated sequence including safety solutions for man-machine interface.



MAX<sup>™</sup>: This autonomous vehicle will improve flexibility, logistic fluidity and inventory management while mitigating the risks associated with human driving.

#### Smelter 4.0!

The Smelter 4.0 concept refers to the fourth industrial revolution. A collective term for value chain technologies and concepts, it is driving our vision of the Smart Automated Smelter.

This vision's starting point is based on the standardisation and systematic deployment of ALPSYS<sup>™</sup> and MESAL<sup>™</sup>, our high business value content solutions, across all our facilities.

These standardised solutions allow us to easily centralise and optimise operation supervision at our **Aluminium Operation Centre.** This enables all smelters, ports and the rail system to be operated from a single location, significantly enhancing overall system efficiency. Moreover, our autonomous vehicles, cranes and drones will ultimately be operated remotely from this location. By standardising our systems and data sources, the Smelter 4.0 concept will leverage new Big Data Analytics capabilities for smelting process optimisation, predictive maintenance and predictive quality across all workshops. This Processing Excellence Centre's role is to provide our operation with these advanced predictive tools.

Visualisation and collaboration tools (mobile, wearables, 3D) are also key to providing real-time information from the shop floor and across the whole value chain, allowing us to optimise processes, maintenance and logistic activities.

The ultimate goal of this vision is to have a fully **Smart Automated Smelter** with lean automated operation performed by unmanned smart machines and optimised via operation flow auto-synchronisation. All these advanced solutions will be connected to a local smart IT middleware continuously interacting with Operation and Processing Excellence Centres.



Standardised IT & automation (High business content)



Wearable intelligence



3D vision (Augmented reality)





Operation centre (Advanced integrated planning)



Big data analytics (Predictive maintenance and process optimisation)



Processing excellence centres

## TMS 2016 Nashville, Tennessee



#### At the TMS Light Metals Conference in Nashville, 14 to 18 February 2016, Rio Tinto will present or sponsor seven presentations.

In **Reduction**, the first presentation "Rio Tinto AP44 cell technology development at Alma Smelter" details the AP44 cell development programme we launched at the Alma smelter in Canada. Based on the AP30 platform, the AP44 design integrates the most recent AP Technology™ developments to deliver a cell capable of operating above 440kA (50 per cent more than the original AP30 cell) with an energy consumption of approximately 13.23kWh/kg. The industrial piloting is currently underway at Alma.

The next article "Alumina dissolution modelling in aluminium electrolysis cell considering MHD driven convection and thermal impact" summarises a collaboration between Rio Tinto Aluminium and École Polytechnique de Lausanne, Switzerland, on the development and validation of a new 3D model that takes into account cell geometry, metal and bath velocities, alumina granulometry and thermal balance. This 3D model is a cornerstone for studying alumina dissolution in technologies with significantly increased cell productivity and reduced liquid bath volume in the pots due to anode surface enlargement.

In the **Environment**, the first paper "The LCL&L process: A sustainable solution for the treatment and recycling of spent potlining" describes the low-caustic leaching and lime (LCL&L) process successfully developed at the Arvida R&D Centre to address the issue of hazardous spent potlining (SPL) waste generated by the aluminium industry. The presentation also discusses valorisation routes for LCL&L process by-products as well as reviews the ramp-up and performance of the industrial plant built in Jonquière, Quebec, to treat 80kt of SPL annually.

The second paper "Development, proof of concept and industrial pilot of the new CHAC scrubbing technology: An innovative, efficient way to scrub sulphur dioxide" presents a promising new CHAC (aqua-catalysed chalked lime, patent pending) scrubbing process developed by our R&D team to address the growing issue of sulphur dioxide emissions. Following small scale trials, laboratory work and full scale proof of concept, we installed an industrial pilot at the Arvida smelter's coke calciner in 2015 to assess the full potential of the CHAC process and demonstrate the process's operational and environmental performance.

In **Carbon**, our first presentation "Anode baking furnace fluewall design evolution: Latest baffleless technology implementation" discusses the long development process of baffleless technology in anode baking furnaces that led to baffleless furnaces in Tomago and in Qatalum, with proven performance in flow and heat distribution, pressure drop and thermo mechanical behaviours, resulting in cost savings for the smelters. The second paper "MIREA: An online quality control equipment integration in an operational context" is presented by Five ECL and co-authored by Alouette and Rio Tinto. It overviews the implementation and operation of state-of-the-art equipment capable of accurately measuring the electrical resistance of baked anodes on a production line. This innovative device reduces carbon process variation and maximises anode performances, improving the smelter's cost effectiveness.

In **Casting**, "Aluminium casting furnace energy efficiency: Recent improvements in Rio Tinto Aluminium casthouses" reviews our ambitious programme to reduce casting furnace energy consumption across our casthouses. The programme's main tool is a standardised energy performance indicator that takes into account not only intrinsic furnace operations but also specific production characteristics to compare energy performance and identify areas of improvement.

Additional news announced in recent months includes:

At the **Metal Bulletin Conference in September 2015 in Vancouver**, we held an AP Technology<sup>™</sup> in operation and under development workshop that included: an overview of our AP Technology<sup>™</sup> reduction cell development philosophy encompassing technical differentiating parameters, the platform approach (HP versus LE) and the greenfield versus creeping approach, a detailed explanation of the AP4X and AP6X platforms, the creeping history and perspective as well as the latest on AP60 and, finally, our vision of the Smelter of the Future.

At the **19th Arab International Aluminium Conference in November 2015 and then at the ICSOBA Conference in December 2015**, we also presented our view of the Smelter of the Future that goes beyond further incremental improvements to a step change in smelters in the not so distant future.

At the **Non-Ferrous Metals and Minerals Congress in Krasnoyarsk**, we presented the evolution and current trends in Anode Baking Furnace (ABF) design over the last 20 years.

#### We also participated in the **19th International Non-Ferrous Conference in Bhubaneswar, India**.

In November, we published an article on the compact casthouse package and new high productivity arrangement for small ingot production at Kitimat in the **Aluminium International Today** journal. Earlier in the year, we had published two articles in the journal. One was on the development of a 500-620kA amperage cell technology with two variants derived from a common platform. The AP60 variant delivers a high productivity cell running in the 570-620kA range, while the APXe variant provides a low energy cell running in the 500-550kA range. The second article was on MESAL<sup>™</sup>, a Manufacturing Excellence Solution for Aluminium that enhances management of all aspects of smelter operations. To help ensure operational excellence, MESAL<sup>™</sup> provides a framework and dashboards for operations management, process quality follow-up, production performance measurement and analysis as well as optimised inventory management.



## The new IPH training catalogue

IPH, our technical training institute, has been serving the aluminium industry for more than two decades. Today the most exhaustive technical training catalogue covering all the skills needed in our industry is available online at:

#### ap-technology.com/ SitePages/Products/ iph.aspx



- Are you looking for training related to a very specific issue?
- Do you want to improve your teams' technical skills?
- Are you seeking the industry's most efficient and comprehensive training?

IPH training is your solution to develop core staff competencies. Contact us for more information.

## AP Technology<sup>™</sup> website

Visit our AP Technology<sup>™</sup> website, where you'll find our technical factsheets, our newsletter and more.

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At Rio Tinto, we're committed to ramping up smelter productivity and driving down energy consumption. From AP40 to AP60 for unprecedented productivity and from AP50 to APXe for dramatically lower energy use, our AP Technology<sup>™</sup> platforms continue to break new ground.

#### Contacts

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