AP Technology™

AP30/AP40
The world’s benchmark reduction technologies

AP30/AP40 smelters: delivering big benefits
Currently operating above 400kA, our high amperage AP40 pots stand as the benchmark in reduction cell technology. Fully integrated into an optimised smelter design, AP40 technologies offer:

• Highest demonstrated amperage with development ongoing at Saint-Jean-de-Maurienne and under construction at Kitimat
• Lowest energy consumption (below 12,500kWh/t) following the development of AP40LE at Alouette and AP4X LE at Saint-Jean-de-Maurienne
• Lowest total cost of ownership with lowest combined capital and operating costs
• Industry’s most bankable and dependable solution
• Most sustainable solution with the lowest energy consumption and GHG emissions, backed by our continuous improvement and innovation pipeline
• Unequalled productivity (above three tonnes/pot/day) and return on capital invested

Rio Tinto Alcan
The AP Technology™ solutions available today meet industry needs by enabling very high productivity or very low energy consumption.

Proven global track record
Today more than six million tonnes of annual capacity are equipped with our innovative AP Technology™ cells. Our AP18 and AP30 solutions operate at amperages ranging from 180 to above 400kA. In 2011, 4,554 AP30 pots produced approximately 4.5 Mt of aluminium around the world or ten per cent of global production.

Continuous improvement
AP30 builds on more than three decades of intensive research and a steady flow of breakthroughs and enhancements. Continuous R&D will enable further amperage increases in the very near future, ensuring ongoing efficiency and productivity improvements in AP30 potlines.

Leading edge AP30 and AP40 technology features include:

- Design amperage above 400kA
- Creeping potential over design values
- Latest ALPSYS process control system including technical management of potlines
- Fully integrated alumina transport design including point feeding system and HyperDense Phase System (HDPS), automatic AlF3 and crushed bath feeding

Substantial savings
The latest AP40 technology reduces capital investment and operation costs through:

- Increased amperage over 400kA
- Specific consumption below 12,500 kWh/t
- Low anode effect rate below 0.03 per pot per day
- High potline equipment productivity – Increased number of pots per potline (above 400) – Reduced number of PTAs
- High environment, health and safety standards including electrical safety
- Improved building and equipment design
- Comprehensive engineering packages and training modules
- Experienced support teams at all project stages
- Reduced construction time and rapid start-up
Number of AP30 pots

![Graph of Number of AP30 pots over time]

Number of pots by potline

![Graph of Number of pots by potline]

AP30 pot production increase (from older smelters to future projects and R&D potential)

![Graph of AP30 pot production increase]

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<table>
<thead>
<tr>
<th>Time (years)</th>
<th>Existing smelters</th>
<th>New projects</th>
<th>2012 actual production</th>
<th>Initial design production</th>
</tr>
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<tbody>
<tr>
<td>1986-1990</td>
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<td>1990-1994</td>
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<td>1998-2002</td>
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<td>2002-2006</td>
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<td>2006-2010</td>
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<td>2010-2014</td>
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<td>2014-2018</td>
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Industry leading performance

<table>
<thead>
<tr>
<th>Periods</th>
<th>Overall AP30</th>
<th>Mean results</th>
<th>Most productive AP30</th>
<th>Most energy efficient AP30</th>
<th>Kitimat basic data list – AP40</th>
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</thead>
<tbody>
<tr>
<td>Number of potlines</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Number of pots</td>
<td>4,554</td>
<td>4,554</td>
<td>4,554</td>
<td>360</td>
<td>336</td>
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<tr>
<td>Total production (kt)</td>
<td>52,187</td>
<td>4,453</td>
<td>3,737</td>
<td>373</td>
<td>315</td>
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<tr>
<td>Current (kA)</td>
<td>340</td>
<td>358</td>
<td>362</td>
<td>375</td>
<td>372</td>
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<tr>
<td>Current efficiency (%)</td>
<td>94.3</td>
<td>94.0</td>
<td>93.1</td>
<td>94.2</td>
<td>93.6</td>
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<tr>
<td>kWh/t</td>
<td>13,336</td>
<td>13,385</td>
<td>13,463</td>
<td>13,798</td>
<td>13,334</td>
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<tr>
<td>Anode effects per pot and per day</td>
<td>0.20</td>
<td>0.22</td>
<td>0.24</td>
<td>0.14</td>
<td>0.12</td>
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<tr>
<td>Iron content in the metal (ppm)</td>
<td>913</td>
<td>898</td>
<td>1,001</td>
<td>882</td>
<td>865</td>
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</tbody>
</table>

Potline retrofit
At Rio Tinto Alcan, we’ve participated in numerous pot modernisation projects. In each case, a complete assessment of existing pots is conducted to evaluate the potential gains including:

- Increased production and labour productivity
- Improved specific consumption (energy and raw materials)
- Enhanced environmental protection and working conditions

Leading edge AP Technology™ solutions are integrated into the modernisation process: potshell and lining, busbars, superstructure, anode system, alumina feeding, environmental protection, assistance to operation and, last but not least, the ALPSYS pot process control system.

Industry leading performance
Since 1988, AP30 pots have produced more than 52 million tonnes of metal, confirming daily their reliability, robustness and performance. They’re demonstrating the flexibility and full range of AP Technology™ solutions, from high productivity to low energy consumption.

AP Technology™: the industry’s leading reduction package
Pot technology is only one aspect of a smelter’s performance. At Rio Tinto Alcan, we’re committed to developing advanced smelter technology solutions that deliver exceptional performance and value today and in the future.

- Most comprehensive and advanced package
- Lowest full economic cost
- Unmatched industry and operating performance
- Most environmentally friendly technology
- Unrivalled credibility and unique bankability
- Extensive integrator experience