

# GENISIM

**a Canadian company 100%  
owned by Dr. Marc Dupuis**



**GENISIM**

# GENISIM

- Offers independent cell modeling and design expertise
- Distributes licenses of its proprietary aluminium reduction cell modeling technology

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- Market niche:** Transfer its proven cell modeling technology and recognized expertise performing lining design retrofit studies to any aluminium company interested.
- To avoid to have to:** Buy “Black box” retrofit design from competing aluminium companies like: Hydro/VAW, Alcan/Alusuisse, Pechiney, etc.
- Or to take years to:** Develop that skill internally with the support of consultants or academic institutions less familiar with the process.

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	START-UP	LATEST POTS
	1992	1998
<b>PRODUCTION :</b>		
• Production per pot/day (kg)	2245	2466
▪ Current efficiency (%)	94.5	96
<b>POWER :</b>		
• Amperage (kA)	295	319
• Pot voltage (V)	4.330	4.185
▪ DC kWh/t	13 650	13 000
<b>CONSUMPTIONS :</b>		
• Gross carbon (kg/t)	540	493
• Net carbon (kg/t)	410	397
▪ Anodes cycle-shifts-8 hours	80	90
<b>METAL PURITY :</b>		
• Iron (ppm)	---	700
▪ Silicon (ppm)	---	240
<b>POT CONDITION :</b>		
• Anode effects (pot/day)	0.40	0.20

Tableau no. 1 : Lauralco's results

## Success Story

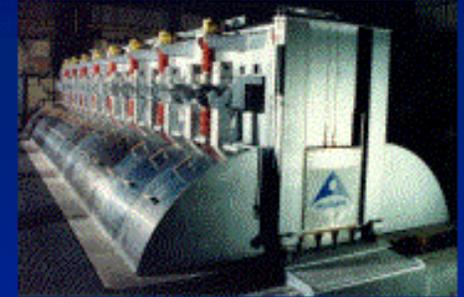
Lauralco used GeniSim 3D ANSYS® thermo-electric models and Dyna/Marc cell simulator to improve their cell lining design.

Lauralco is now considered the most efficient smelter in the industry.

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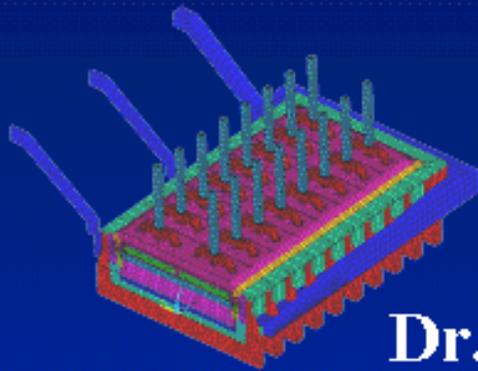


## Dr. Marc Dupuis Experience in R&D

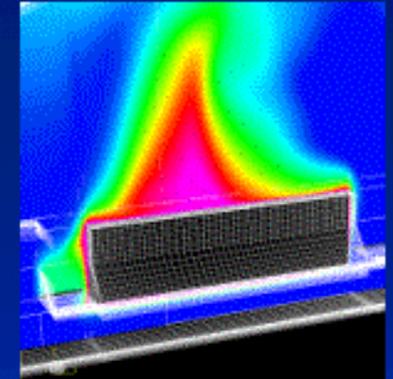
### With Alcan

- 1980-1984: Wrote his own 2D CFD code to study potroom ventilation problems as part of his Master and Ph.D. project.
- 1984-1986: Created a new generation of 3D cell heat balance models based on ANSYS® commercial finite element code.
- 1987-1989: Designed the A265-H and the A310 experimental cell cathode lining.
- 1989-1992: Was the project leader for the development of thermo-mechanical models of the cell.
- 1993-1994: As senior research engineer, was in charge of the R&D for the modeling of all the aspects of the cell (thermo-electric, thermo-mechanical and MHD).

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## Dr. Marc Dupuis Experience in R&D

### With GeniSim

- 1994-1995: Wrote his own dynamic cell simulator now distributed by GeniSim under the name Dyna/Marc.
- 1997-2002: Released 8 upgrade revisions of Dyna/Marc cell simulator.
- 1998-2002: Developed ANSYS® based 2D+ and 3D steady-state and 2D+ dynamic full cell slice thermo-electric models.
- Developed ANSYS® based 3D cathode block erosion model.
- Developed CFX-4 based 3D potroom ventilation model.
- Developed ANSYS® based 3D full cell quarter and full cell half including the liquids zone and busbar thermo-electric models.

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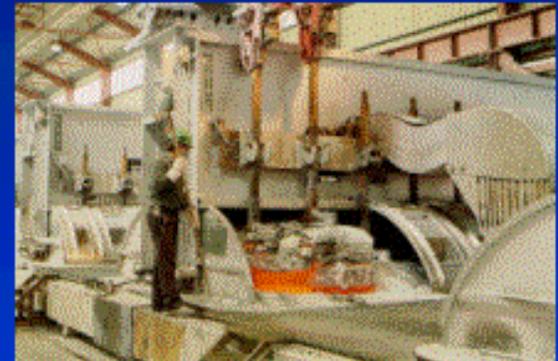
## Dr. Marc Dupuis Experience Building T/E Models

With Alcan  
1987-1994:

Alcan prototypes: A275, A265-H, A310  
Alcan prebaked: A70, A140, A165  
Alcan HSS  
Alcoa P155  
Pechiney AP18

With GeniSim  
1996-2002:

Pechiney AP30  
Alcoa: P155, A697  
Reynolds prebaked: P-19, P-20S, P-23S  
Kaiser P69  
Reynolds HSS  
Pechiney HSS  
Alcan VSS



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## Dr. Marc Dupuis Communication Experience

From 1980-2002:

Wrote more than 30 technical reports

Presented more than 30 publications

Developed GeniSim web site:

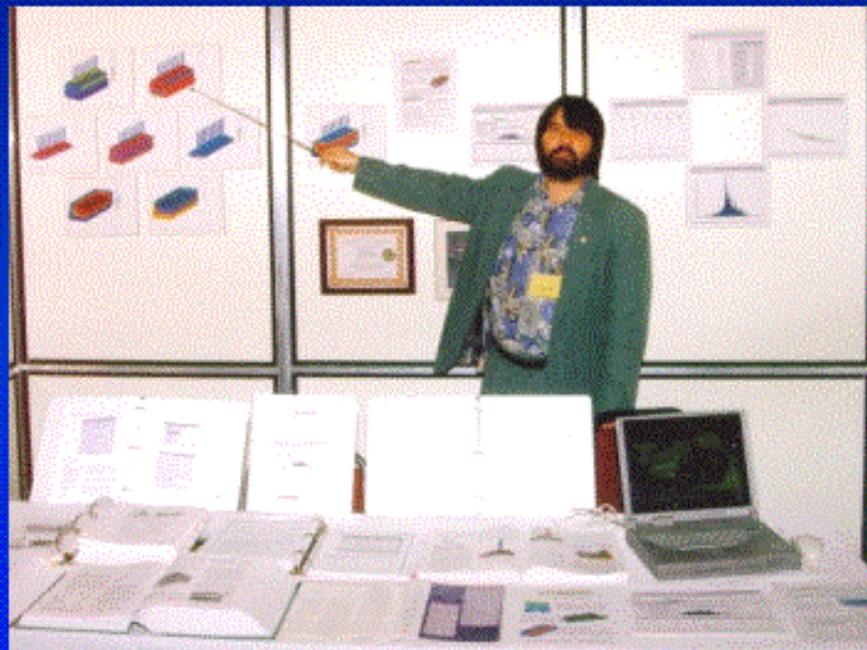
[WWW.GENISIM.COM](http://WWW.GENISIM.COM)

Was a lecturer at the 1997 CQRDA

Electrolysis Symposium

Was a lecturer at the 1997 TMS

Industrial Electrolysis Course



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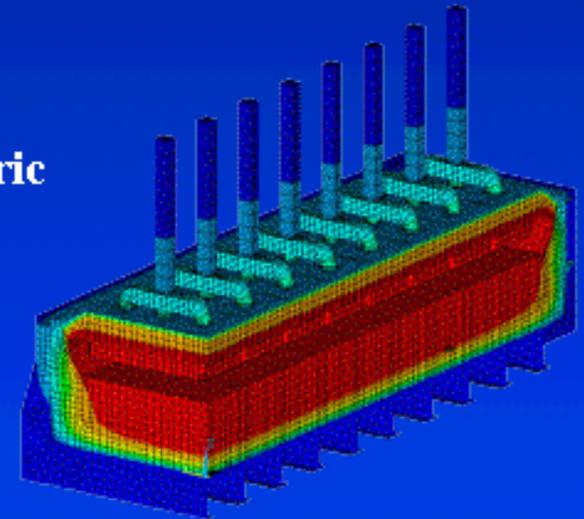
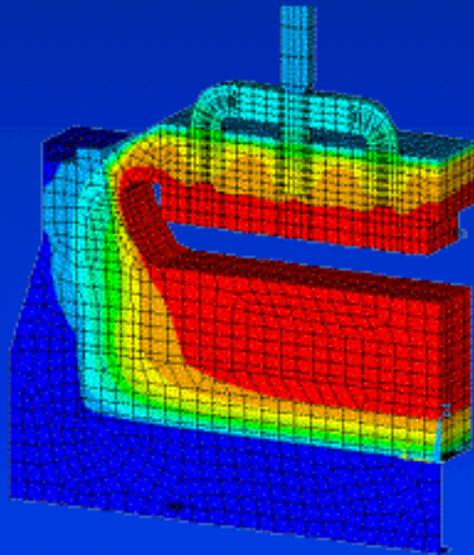
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## Cell Heat Balance Modeling Tools

To decrease the cell power consumption

To increase the cell amperage

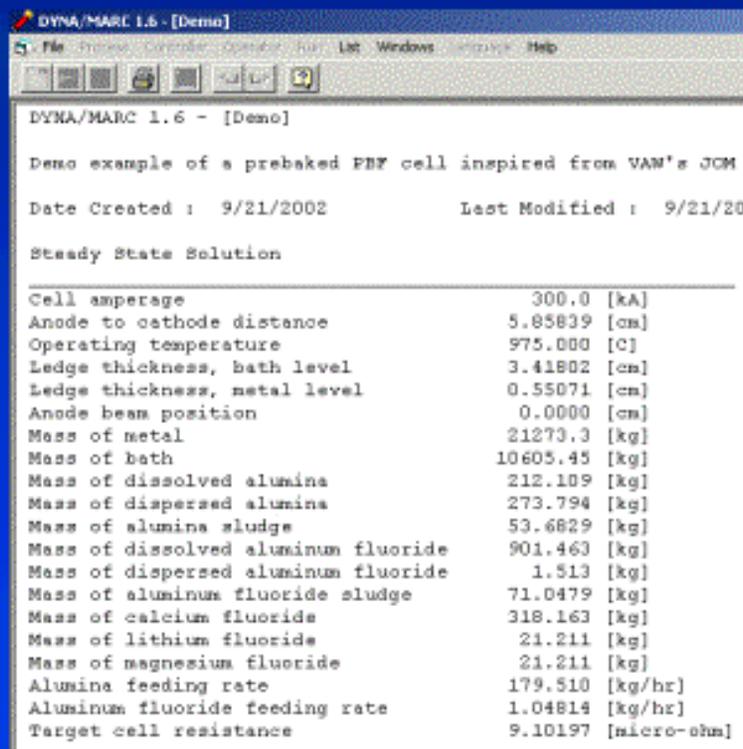
- 3D ANSYS® based thermo-electric steady-state family of models



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## Cell Heat Balance Modeling Tools



DYNA/MARC 1.6 - [Demo]

Demo example of a prebaked PFY cell inspired from VAM's JCM

Date Created : 9/21/2002      Last Modified : 9/21/2002

Steady State Solution

Cell amperage	300.0 [kA]
Anode to cathode distance	5.85839 [cm]
Operating temperature	975.000 [C]
Ledge thickness, bath level	3.41802 [cm]
Ledge thickness, metal level	0.55071 [cm]
Anode beam position	0.0000 [cm]
Mass of metal	21273.3 [kg]
Mass of bath	10605.45 [kg]
Mass of dissolved alumina	212.109 [kg]
Mass of dispersed alumina	273.794 [kg]
Mass of alumina sludge	53.6829 [kg]
Mass of dissolved aluminum fluoride	901.463 [kg]
Mass of dispersed aluminum fluoride	1.513 [kg]
Mass of aluminum fluoride sludge	71.0479 [kg]
Mass of calcium fluoride	318.163 [kg]
Mass of lithium fluoride	21.211 [kg]
Mass of magnesium fluoride	21.211 [kg]
Alumina feeding rate	179.510 [kg/hr]
Aluminum fluoride feeding rate	1.04814 [kg/hr]
Target cell resistance	9.10197 [micro-ohm]

To decrease the cell power consumption  
To increase the cell amperage

- Dyna/Marc very fast  
“lump parameters+”  
steady-state cell heat  
balance model

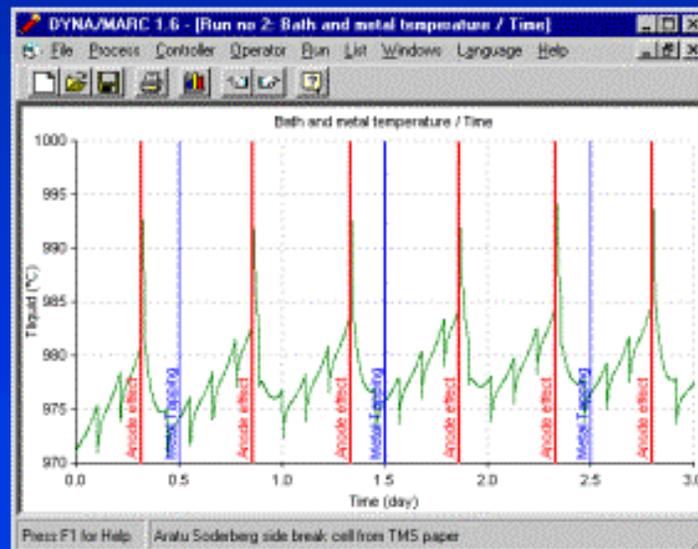
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## Cell Operational Changes Analysis Tools

To analyze the impact of power modulation

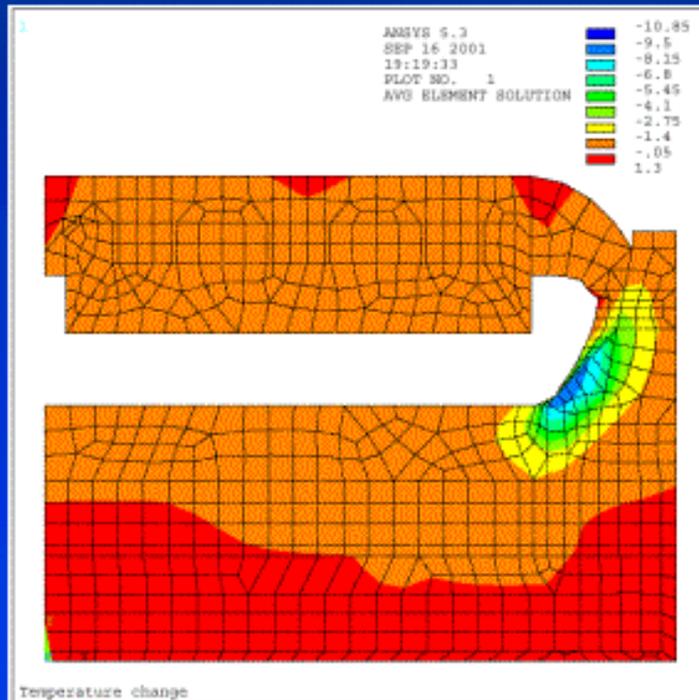
To analyze the impact of an improved control logic



- Dyna/Marc very fast “lump parameters+” dynamic cell heat and mass balance model

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## Cell Operational Changes Analysis Tools



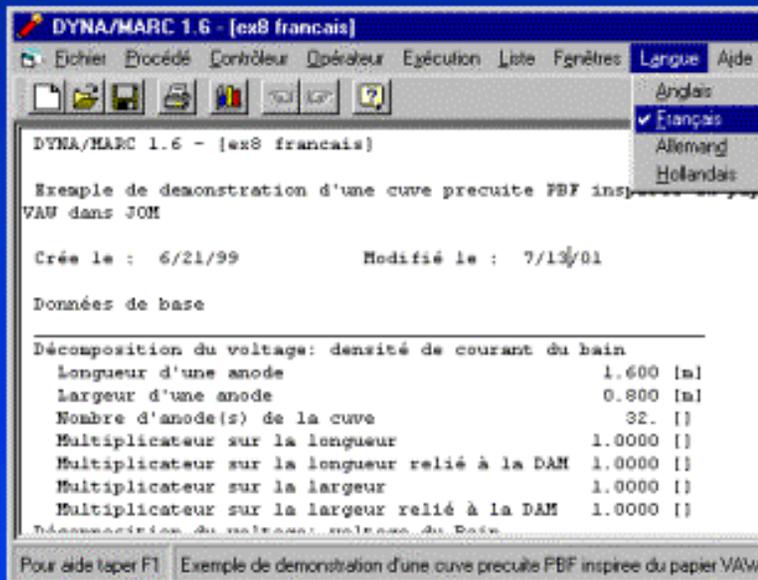
To analyze the impact of power modulation

To analyze the impact of an improved control logic

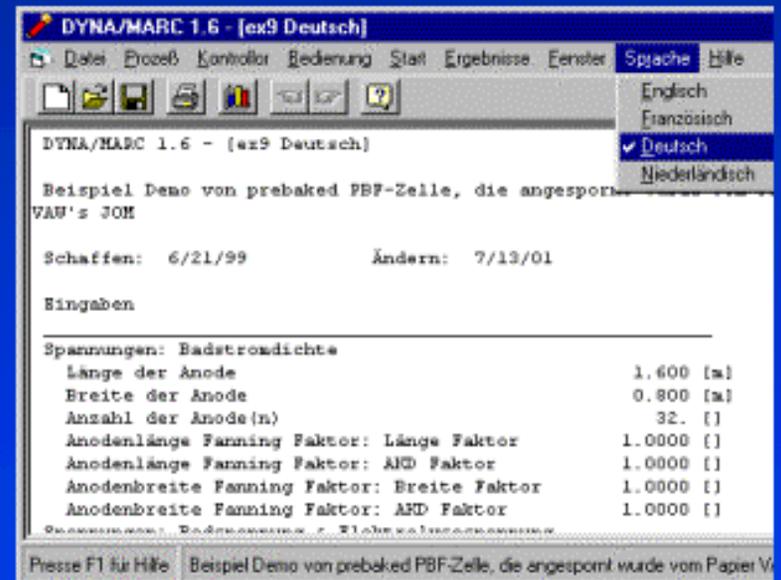
- 2D+ ANSYS® based thermo-electric full cell slice dynamic model

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## Potroom Operator Training Tool

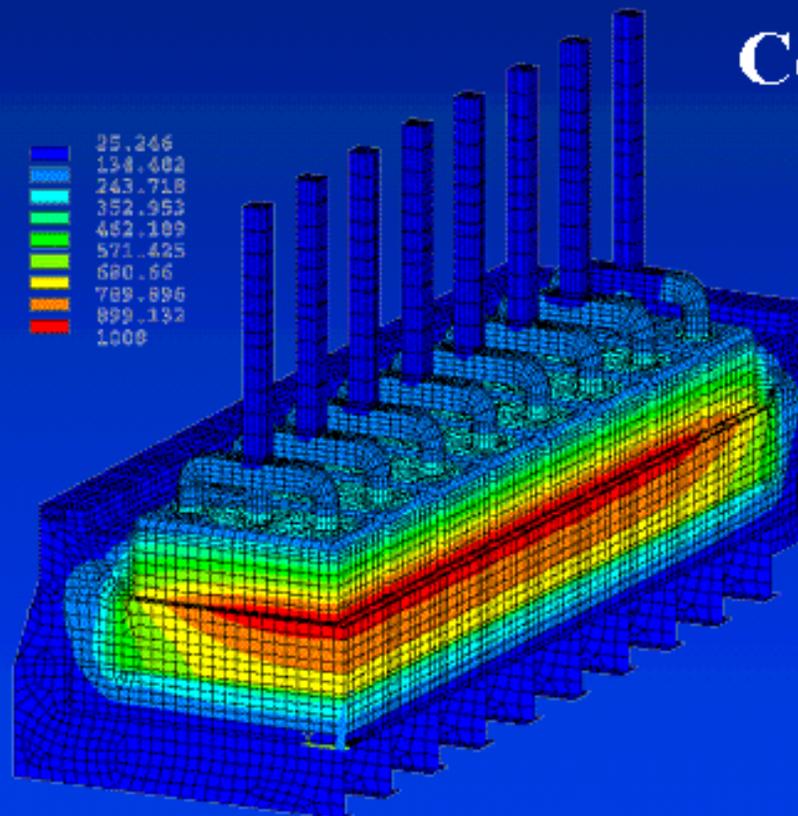


- Dyna/Marc: a Windows based Multilanguage easy-to-use dynamic cell simulator



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## Cell Life Analysis Tools



To reduce early lining failure  
To reduce cathode erosion rate

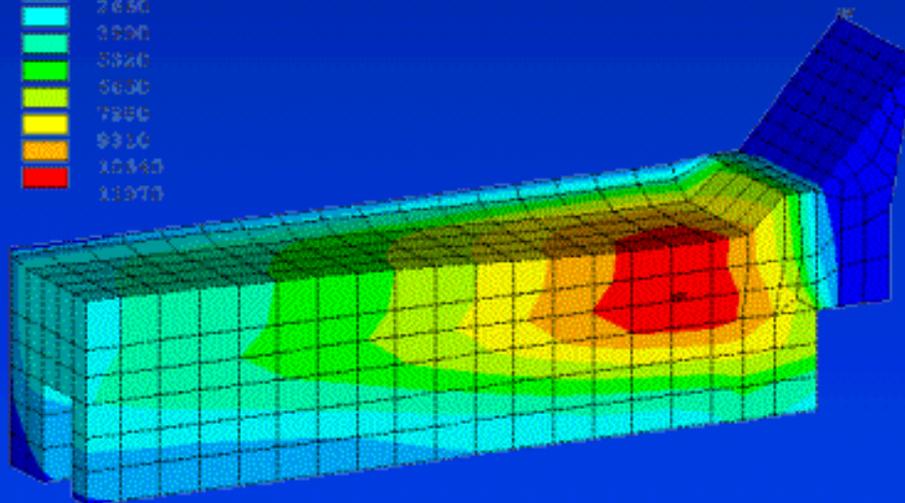
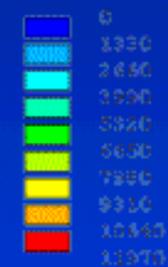
- 3D ANSYS® based thermo-electric dynamic full cell quarter preheat model

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## Cell Life Analysis Tools

To reduce early lining failure

To reduce cathode erosion rate



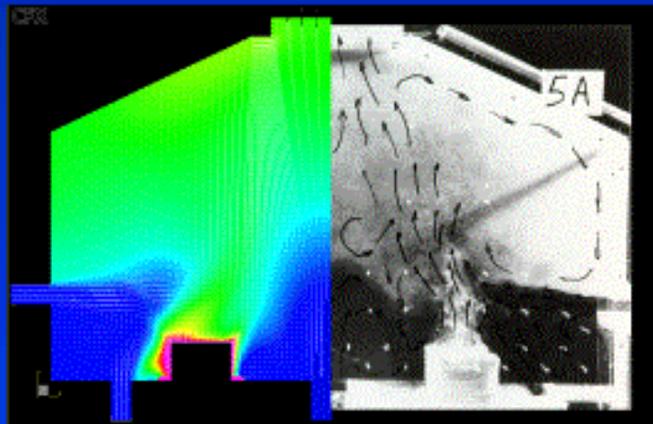
- 3D ANSYS® based cathode block erosion model



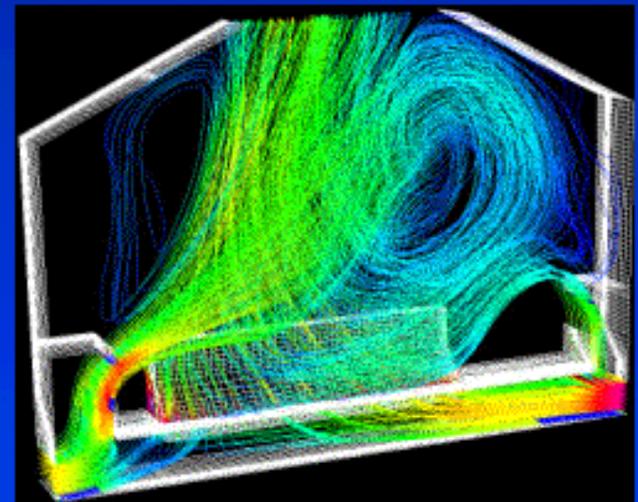
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## Potroom Ventilation Analysis Tools

To improve operators working conditions



- 2D CFX-4 based ventilation model
- 3D CFX-4 based ventilation model



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## Customers list:

### 3D ANSYS® T/E models

**Alcan**  
**Alumax**  
**Reynolds**  
**Hoogovens**  
**Alcoa**  
**Noranda**

### Dyna/Marc cell simulator

**Alcan**  
**Alusuisse**  
**VAW**  
**Alumax**  
**Reynolds**  
**Hoogovens**



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