

AMERICA **ATMO**
sphere
business case
natural refrigerants

June 18-19, 2014 - San Francisco

*How CO₂ allows
innovative processes?*

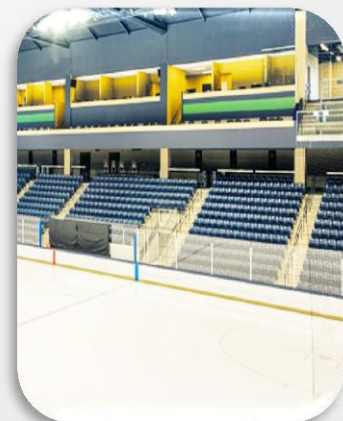
2008



2010

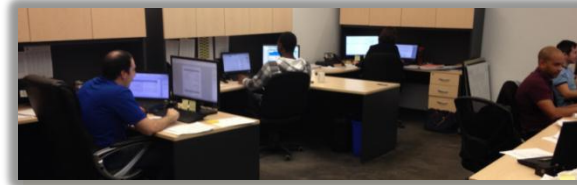


2011

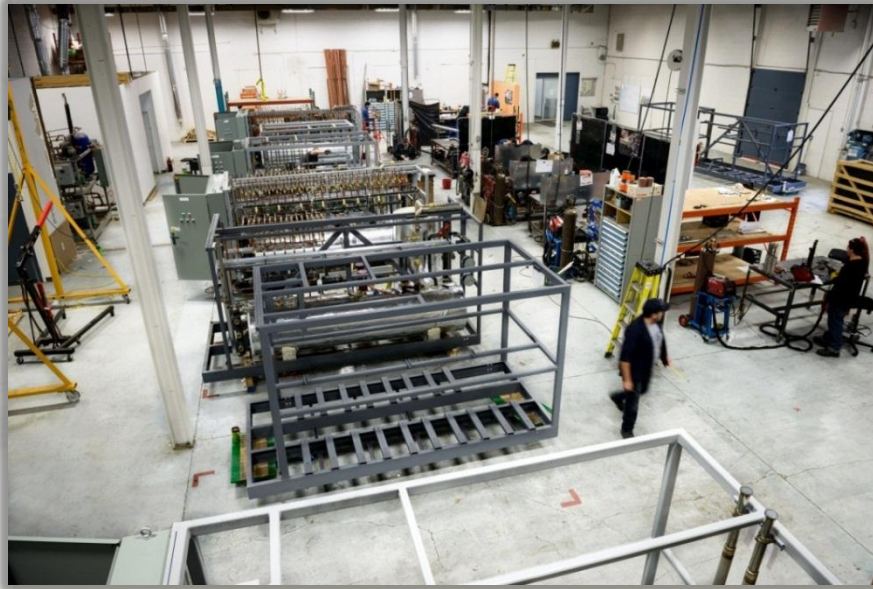


Our head office in Quebec

15 engineers
5 technicians
4 to 30 production employees
5 administration people



Production



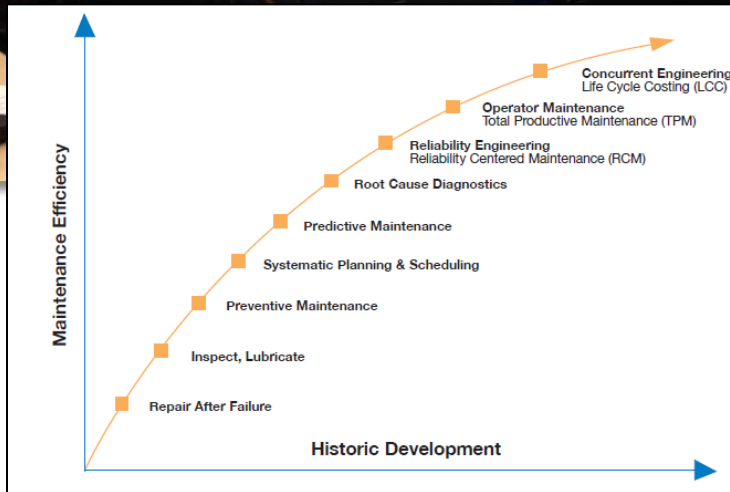
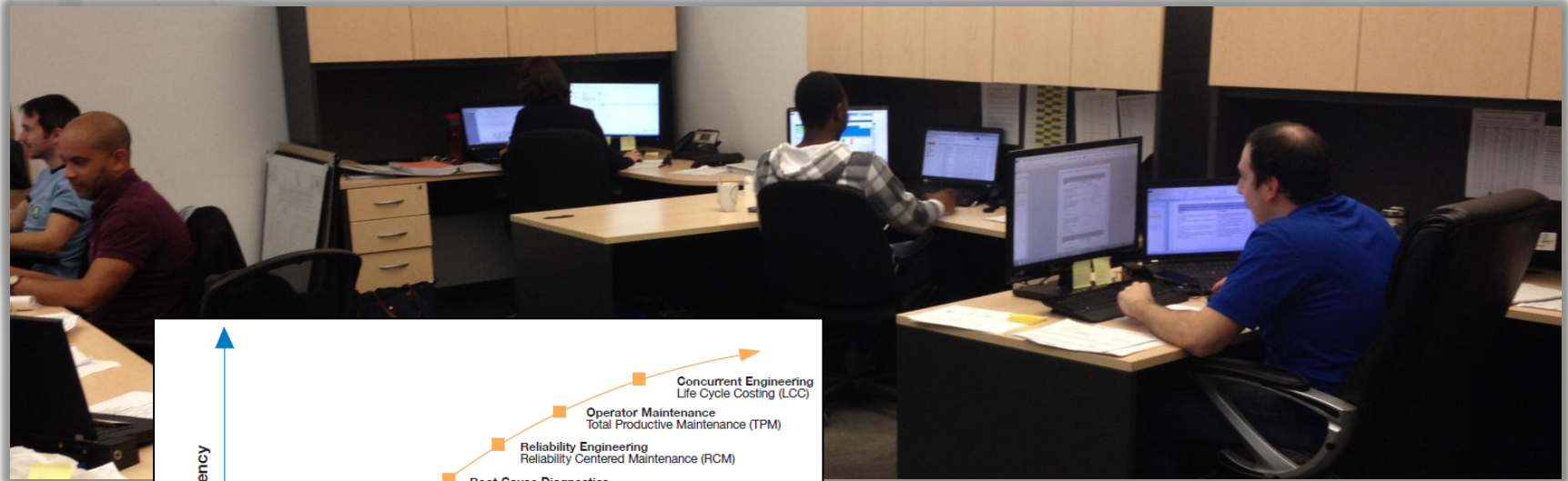
Capacity :

- 15 racks at the same time
- 9 days per rack at 8 hours per day
- 1825 racks per year (theoretical actual production capacity)



Customer service at your service

- Remote supervision
- Energy commissioning
- Engineering retroaction
- Educational tool



Learning curve

It is this **experience** and this **quality** of customer service that has enabled us to work with **25 different service contractors**.
And to continually enhance our systems

Our product lines

Engineering



Product lines:

Super Market

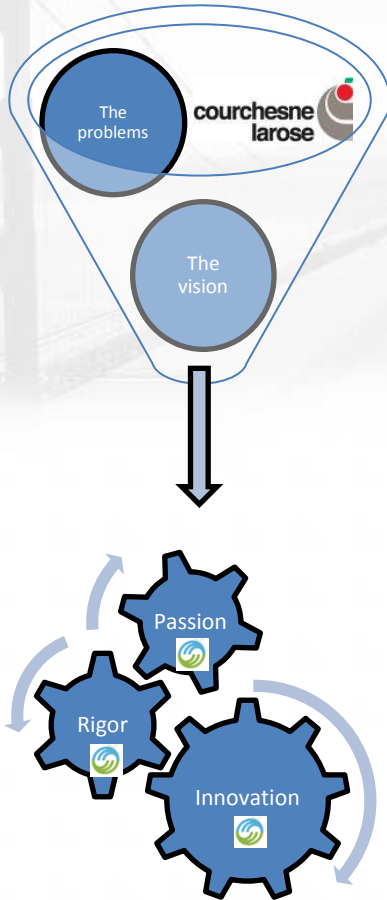
- HFC/Glycol
- HFC/CO₂
- **Transcritical CO₂ version**

Distribution Center - NH₃/Glycol

- HFC/Glycol
- NH₃/CO₂
- **Transcritical CO₂ version**

Ice rinks

- NH₃/Secondary fluid
- NH₃/CO₂
- HFC/CO₂
- **Transcritical CO₂/Secondary fluid**
- **Transcritical CO₂/Recirculated CO₂**



NH₃/CO₂ REFRIGERATION SYSTEM AT COURCHESNE LAROSE (MICHAL INC.)



INTRODUCTION

The major task of food processing applications today is to ensure the freshness of perishable goods. Storages are used to smooth out peaks and troughs in production, allowing a more continuous supply to customers, and help maintain the quality of produce.

The warehouse of Courchesne Larose (Michal Inc.) is spread over an area of 100,000 ft² with 40 ft. of height, able to accommodate 2 069 945 kg (4 563 442 lbs) of food per day. It includes 22 ripening rooms for bananas, a main dock with 19 garage doors, a banana dock with 3 garage doors. The temperature in the rooms varies between 0 and 15°C.

Carnot Refrigeration Inc. has designed and manufactured an ideal system for this warehouse. Our refrigeration system with NH₃/CO₂ has a great advantage because it greatly minimizes environmental impacts. Although this system is recent, it should be emphasized that Carnot Refrigeration Inc. has integrated innovative new technologies, namely the total recovery of the heat rejected by compressors.



ABOUT THE COMPANY

Since 2008, Carnot Refrigeration has been leading the CO₂ market in Canada. The company offers integrated services for the design, manufacturing and installation of high quality and eco-efficient CO₂ systems for supermarkets, industrial applications and ice rinks.

More information at:
www.carnotrefrigeration.com

CONTACT INFORMATION

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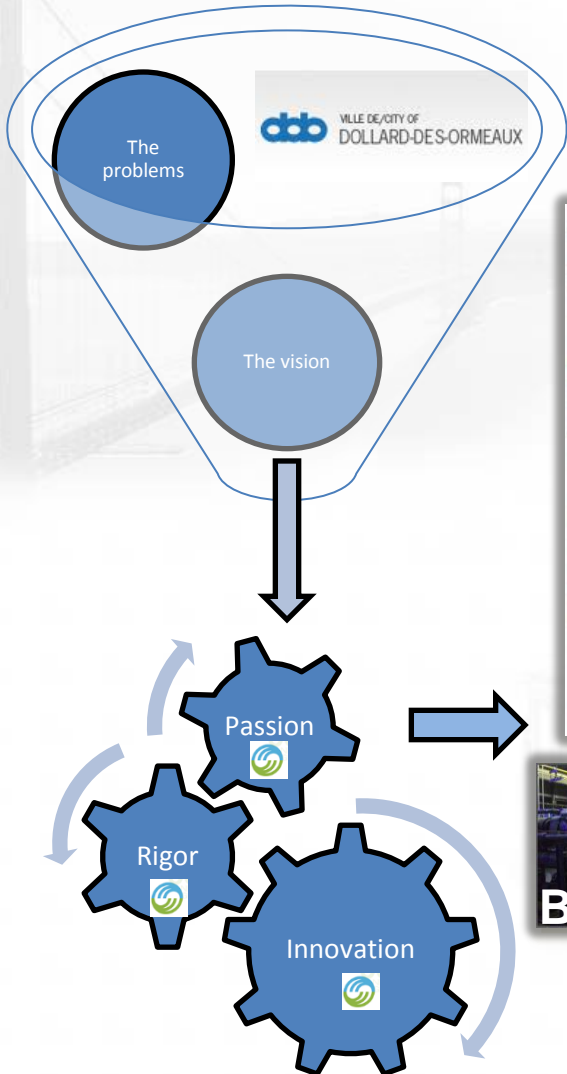
Simon Bérubé, P.E.
simonberube@carnotrefrigeration.com

ABOUT THE SYSTEM

The major advantages of this technology are summarized as follows:

- Totally eliminate the use of HFC's and / or HCFC's.
- Reduce the ammonia quantity drastically without energy penalty.
- Reduce piping and insulation size by more than half and the related labour and material cost by 31.5%.
- Reduce the use of parasismic hangers and the structural need to support the pipes.
- Ammonia confined to the mechanical room.
- Provide full heat reclaim (if needed) for space heating or water heating (domestic or process).

Business Case Ice Rink



Business Case Supermarket

Congress of the United States
Washington, DC 20515
December 3, 2013

The Honorable Gina McCarthy
Administrator
Environmental Protection Agency
Arist Rios Federal Building
1300 Pennsylvania Avenue, NW
Room 3000
Washington, DC 20460

Dear Administrator McCarthy,

We are writing to ask your agency to pursue commonsense policies that accelerate the phase down of hydrofluorocarbons (HFCs) in this country and globally. We believe the agency can ensure we continue to have affordable, safe refrigeration and air conditioning, while also driving greenhouse gas emissions down.

Since its ratification in 1989, the Montreal Protocol has been an example of a highly successful multi-national environmental initiative. Under the Montreal Protocol, U.S. corporations and corporations in participating countries agreed to replace ozone depleting products – such as Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs) – used globally in refrigerants, aerosols and solvents. As a result, we have seen a 97% reduction in the global consumption of controlled ozone depleting substances.

Today, most countries are choosing to replace CFCs and HCFCs with HFC compounds because HFCs have been found to be a safe and efficient alternative. The United States has already made the transition to HFCs, meaning HFCs are now used in a majority of our air conditioners and refrigerators found in our homes, cars, hospitals, and supermarkets. Developing countries participating in the Montreal Protocol are now starting to make their transitions – ramping up their use of HFCs. As a result, the global use of HFCs is expected to grow rapidly in the coming years. The increased HFC use is good for the ozone layer, but evidently not good for our climate. Unfortunately, it is now determined that HFC compounds can have a very high global warming potential. Should their use go unchecked, it is estimated that HFCs could account for approximately 20 percent of greenhouse gas pollution by 2060. So by using HFCs, we are addressing one global environmental problem, while contributing to another.

Our experience with the Montreal Protocol has shown the global community can work together to save the environment without disrupting the market place. That is why using the Montreal Protocol regime to transition the global use of HFCs to materials that are safe for the ozone and safe for our climate makes sense and why we applaud the Administration's efforts to do so. We believe this process will give our country and the world the most flexibility and cost-effective path toward reducing HFCs.

As we wait for global action, some sectors in this country and in other countries are already beginning to transition away from HFCs, influenced by regulation, voluntary programs and a growing suite of alternatives. For example, many home refrigerators and window air conditioning units have changed over to hydrocarbon refrigerants. Transitions are also being seen in vending machines, supermarkets, motor vehicle air conditioning, and insulating foams. In fact, a Hannaford supermarket just opened in Turner, Maine that is the first HFC-free supermarket in the country. It is estimated that the new system will reduce the store's carbon footprint by 3.4 million pounds of carbon dioxide equivalent every year and will save the store money in the long run in repair and energy costs. Not all sectors have a clear transition, but for some sectors there are clear, safe alternatives to HFCs.

Recognizing that it may take some time to amend the Montreal Protocol and incorporate these changes into US regulations, we believe the EPA does not need to wait to implement smart policies that can help accelerate these transitions in the United States and globally. We encourage you to focus your agency on HFC applications where technology solutions and alternative products are already available or soon to be in the market, similar to what the European Union has done with their Mobile Air Conditioning Directive. The agency should look to where market transitions are already underway – like in Turner, Maine – and where EPA action could hasten the pace of those transitions, both domestically and elsewhere. We think that such actions would not only have significant cost-effective environmental benefits but would also strengthen the Administration's hand in the Montreal Protocol negotiations. Thank you for your efforts in this area and we look forward to working with you on this issue in the future.

With best personal regards, we are

Sincerely yours,

Tom Carper
Tom Carper
U.S. Senator

Scott Peters
Scott Peters
Member of Congress

Alan Lowenthal
Alan Lowenthal
Member of Congress

Gregory Meeks
Gregory Meeks
Member of Congress

Anna T. Lujan
Anna T. Lujan
Member of Congress

Susan A. Davis
Susan A. Davis
Member of Congress

Edward Markey
Edward Markey
U.S. Senator

Kristen L. Gilliland
Kristen L. Gilliland
U.S. Senator

Robert Menendez
Robert Menendez
U.S. Senator

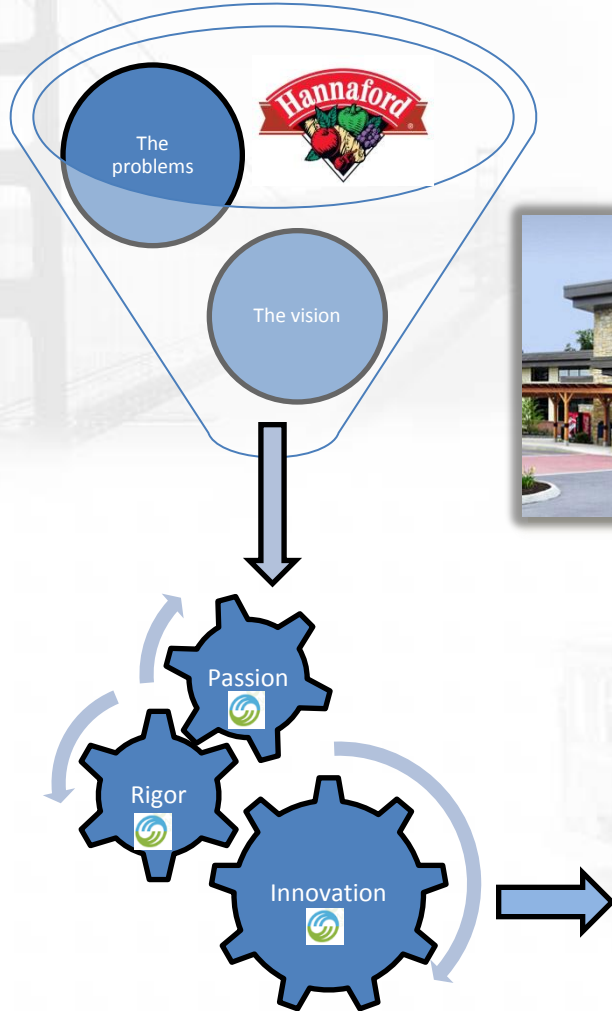
Burton Roemer
Burton Roemer
U.S. Senator

Melissa Whitcomb
Melissa Whitcomb
U.S. Senator

Christopher Murphy
Christopher Murphy
U.S. Senator

Patro Fitzmaurice
Patro Fitzmaurice
U.S. Senator

Christopher A. Coons
Christopher A. Coons
U.S. Senator

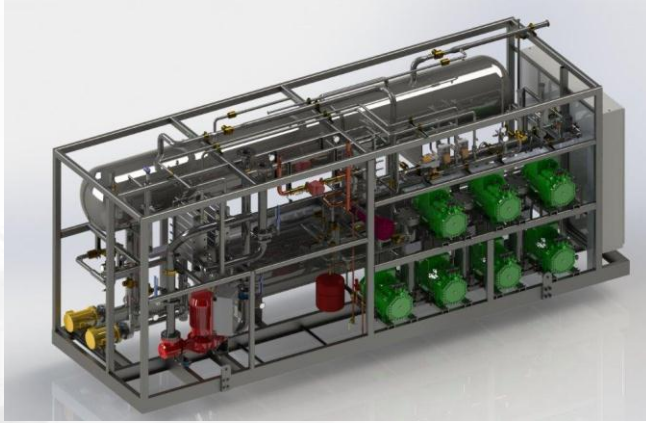


"Best of the Best" Prize 2013

Warehouses



Ice rinks



Canmet comparative study on ice rink refrigeration system

Performance of CO2 natural refrigerant systems

Tableau 3 : Sommaire des données financières sur les systèmes étudiés

NO. DE SYSTÈME	IDENTIFICATION		INVESTISSEMENTS			COÛTS D'EXPLOITATION				COÛT GLOBAL			
	TYPE D'ASSEMBLAGE	RÉFRIGÉRANT	COÛTS D'ACHAT ¹	MOINS SUBVENTION ²	INVESTISSEMENT INITIAL NET	ÉNERGIE	ENTRETIENS ANNUELS	ENTRETIENS + RÉPARATIONS PÉRIODIQUES	FORMATION INITIALE ET CONTINUE	VALEUR ACTUELLE ³	ERREUR SUR LES TAUX 95 % CERTITUDE ⁵	ANNUITÉ	ÉCARTS ⁴
			(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$/AN)	%
A1	Monobloc	R717	912 000	596 300	315 700	930 400	307 400	45 800	32 100	1 631 400	±170 000	109 700	-44 %
A2	Sur place	R717	2 347 500	831 600	1 515 900	1 044 200	282 100	54 900	32 100	2 929 600	±184 000	196 900	0 %
A3	Sur place	R717	2 177 000	817 400	1 359 600	1 160 200	267 600	63 500	32 100	2 884 000	±199 000	193 800	-2 %
A4	Monobloc	R717	909 800	594 700	315 100	933 800	265 800	63 200	32 100	1 611 100	±168 000	108 300	-45 %
A5	Monobloc	R717	949 400	616 600	332 800	888 300	278 800	52 600	32 100	1 585 400	±162 000	106 600	-46 %
C1	Bibloc	R744	1 286 000	600 700	685 300	825 600	267 600	35 500	32 100	1 850 500	±149 000	124 400	-37 %
C2	Bibloc	R744	719 500	512 100	207 400	857 600	253 100	41 900	32 100	1 392 800	±152 000	93 600	-52 %
H1	Sur place	R22	82 000	0	82 000	1 843 300	289 300	106 000	18 100	2 373 800	±305 000	159 600	-19 %
H2	Monobloc	R507A	751 900	102 600	649 300	1 054 900	214 600	42 500	18 100	1 980 100	±177 000	133 100	-32 %
H3	Modulaire	R410A	399 300	98 000	301 300	1 205 900	179 000	51 800	18 100	1 756 400	±196 000	118 100	-40 %
H4	Modulaire	R507A	682 000	88 300	593 700	1 119 100	291 100	40 500	18 100	2 063 200	±193 000	138 700	-30 %
H5	Monobloc	R134A	649 000	108 200	540 800	1 111 200	90 400	40 400	18 100	1 801 300	±174 000	121 100	-38 %

Base de comparaison

1 Coûts d'achat inclus salle mécanique classe T pour l'ammoniac et, pour 11 systèmes, les honoraires professionnels (No. H1 (R22) n'a pas de travaux majeurs)

2 Inclus la somme des contributions du Mels, d'Hydro-Québec et du BEIE (programme OPTER)

3 VA: valeur actuelle calculée sur 20 ans, les valeurs résiduelles ne sont pas incluses dans ce tableau

4 Écart par rapport au système de référence A2 (R717)

5. Les taux financiers qui ont servi à calculer les valeurs globales sont listés dans le Tableau 8 avec les incertitudes correspondantes. Les variations probables ont été obtenues en faisant varier aléatoirement les valeurs des incertitudes sur les taux. L'échantillon comporte 500 combinaisons aléatoires de ces taux. Chaque valeur montre une erreur qui englobe 95 % des combinaisons.

Reliable and Efficient



“Best of the Best” Prize 2013



“ASHRAE Best Technology – Industrial facility” Prize 2010



“GreenChill Platine” Certification 2013

“Prix Energia” Prize 2013

“Étude du Canmet”



“Innovation & Développement” Prize 2013



“Cleantech Next10” Prize 2012



“Développement technologique & Innovation” Prize 2012



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Thank you very much!