Study Tour Canada

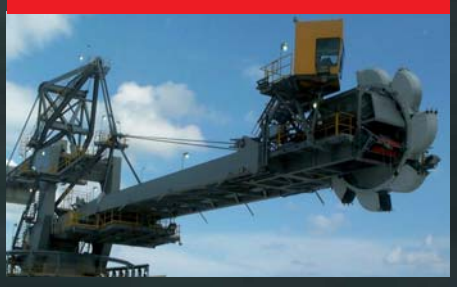
Final Report
Study Tour Canada, may 2009
Dispuut Transportkunde

From Toronto to Montréal

Siemens Power Generation; State-of-the-art gas turbines

Lauzon Sawmill; Canada's largest hardwood sawmill

EMS Tech; engineering of bulk material handling systems



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Logistics extra large

From the Board

Every year, Dispuut Transportkunde organizes a study tour at the end of the academic year. This year, a team of five enthusiastic students organized a ten day tour to Canada. As a result, twenty-two lucky students have traveled from Toronto to Montreal, have seen some Canadian companies and have spent a weekend in both impressive, but completely different cities.

To make the tour affordable for all students, nine companies, one association and one fund financially supported the tour. Finding and convincing companies who showed some interest in engineering students was hard, a lot harder than expected. Due to the worldwide economic crisis, most companies don't need new, freshly graduated engineers, especially in a very dynamic sector like the transport sector.

But why Canada? As you can imagine, big discussions took place before finally choosing Canada.

Other countries like Russia, Japan and some other exotic countries were discussed as options, but Canada is a beautiful, affordable and in some way Dutch connected country. A lot of people would compare Canada to the USA, but there is almost nothing more offensive for a Canadian than calling him an American. Last year, the study tour went to the USA, and a few of those people got the opportunity to join the trip to Canada as well.

What are the biggest differences between the USA and Canada? For example, Canada recycles empty beer bottles and cardboard boxes, as we have seen at the New Forest Paper Mill and at the Molson Brewery. Another example, the Wall Mart distribution centre recently installed motion detectors in the lighting system of their enormous centre. Canada is way behind the energy saving culture of Europe, but way ahead of the USA. Almost every company we visited paid some special attention to the environmental impact of the company.

But on the other hand, Canada is like the USA in some ways. The cars, or should I say busses, we drove in those ten days, aren't exactly small and energy efficient. The drivers didn't mind of course, who wouldn't prefer a big American SUV V8 above a Japanese minivan? Driving a bigger car consequently resulted in needing more space on the road, whether it's the road behind you when reversing or the road next to you when turning. Something not all drivers realized... Furthermore, Toronto is like every other American city and its baseball team The Toronto Blue Jays competes in the American league. Although this time, the Blue Jays did beat the New York Yankees! ■

Roel Vissers
Bob Riemslag
Paul Stoop
Bob Vermeer

Dispuut Transportkunde

From the Staff

In October 2008 the students association announced an international study tour to the East part of Canada. This initiative was appreciated by the staff of the department Transportation and Logistics Engineering as such study tours really contribute to the build-up of practical knowledge experience during a Masters study. We accepted the invitation to join the group and during the 10-day trip in May 2009 valuable experiences were collected. An impression of the learnings during the study tour is presented in this report.

Transport and logistics engineering is a broad field of engineering and research with many applications in a wide variety of industries. This was very well illustrated during the tour, starting with an impressive visit to a large gas turbine factory with many kinds of heavy lift equipment. During the trip the feeling of "big is beautiful" was experienced many times, especially when visiting Wal-Mart's enormous distribution centre.

During travelling we had many impressions about Canadian life. Some of them were definitely highlights, such as the Niagara Falls, the great baseball match between the Toronto Blue Jays and the New York Yankees (45.000 visitors), the CN Tower and student-life at the McGill University of Montreal.

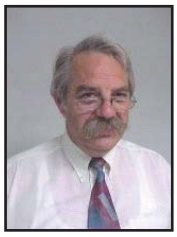
The report shows very well that this type of intensive study tours really contributes to the international approach our students have to develop in a globalized environment, enhanced by transportation and logistics.

Organizing this trip took almost half a year and the organizing committee, formed by Jos van der Geest, Steven Goudswaard, Sander Kleinheerenbrink, Martijn van der Pouw and Robin Voorend had to work hard in a period of economic downturns. But, regardless of last minute changes, induced by some company excuses, the committee succeeded in presenting an interesting and well organized study tour; a job well done!

We'd like to thank all the visited companies, the generous sponsors and the participants for supporting this successful tour.

We had a great time and learned a lot! ■

Mark Duinkerken
Joan Rijsenbrij



Prof. ir. J.C. Rijsenbrij

Ir. M.B. Duinkerken

Wie heeft het lef om tegen de stroom in te varen?

De eerste keer dat Huisman een schip ontwerpt, is het meteen wereldnieuws. Terwijl de hele offshore-industrie steeds grotere schepen ontwerpt om dieper te kunnen boren, varen wij namelijk ijskoud tegen de stroom in. Met een schip dat een stuk compacter is dan zijn voorgangers, maar wel betere prestaties levert. Hoe dat kan? Ontwerp en uitrusting van het schip zijn door ons geoptimaliseerd, door beide als één geheel te zien. Doordat we de traditionele boortoren hebben vervangen door een slimme, compacte, zogeheten 'multi-purpose tower' ligt de boorvloer in ons ontwerp circa 20 meter lager dan in een traditioneel boorschip. Aan een technicus als jij hoeven we niet uit te leggen wat dat betekent... Het is slechts één van de sterke staaltjes techniek die onze medewerkers steeds opnieuw weten te realiseren. Ben jij een (ervaren) technicus en wil je op nuchtere Hollandse wijze meewerken aan technische prestaties van wereldformaat, ga dan naar **www.huisman.info**.

Dual Multi Purpose Tower (DMPT)

Huismans expertise in hijswerktuigen zien we terug in de DMPT: een door Huisman zelf ontworpen boortoren met kokerconstructie. In de koker is zowel de lier als de deiningscompensator geïntegreerd. De toren is multifunctioneel: hij kan niet alleen worden gebruikt om te boren, maar ook voor bijvoorbeeld onderzeese installatiewerkzaamheden. De voorzijde is gereserveerd voor booractiviteiten, terwijl de achterzijde gebruikt kan worden voor constructie-werkzaamheden.

Splittable Block

Met een variabel katrolsysteem kan de operationele snelheid van het hijsblok maximaal worden vervierdubbeld. Via een druk op de knop kunnen katrollen worden toegevoegd of afgekoppeld.

Hoe kunnen hbo/wo-technici ons daarbij helpen?

Huisman is gespecialiseerd in het ontwerpen en bouwen van hijskranen, pijpleg- en boorinstallaties voor de scheepvaart-, offshore- en civiele industrie over heel de wereld. Onze groeiende onderneming biedt mooie kansen voor ambitieuze technici op hbo- en wo-niveau. Want alleen met de kennis, creativiteit en het lef van onze medewerkers kunnen we ons bedrijfsdoel realiseren: van concept tot constructie, waarbij unieke prestaties in unieke projecten worden gerealiseerd. Wil je meer weten over Huisman, ons werk en onze actuele vacatures, ga dan naar **www.huisman.info**.

Huisman

UNIEKE PRESTATIES VRAGEN

From the Organisation

This year, the destination of the study tour of student association 'Transportkunde' was Canada. On the 8th of may a big group of 22 students of the master Transport Engineering & Logistics (TEL) and two staff members went to Toronto. This report gives an overview of all the activities that have taken place during this study tour.

In the area between Toronto and Montreal, 6 companies were visited. This varies from a visit to the biggest hardwood sawmill of North-America to a large gas-turbine factory in Hamilton. It was nice to see that we were so welcome in the companies, as the nice lunches and interesting presentations showed us.
In the middle of the Financial district of Montreal the campus of the McGill University is situated. The Graduate Association for Mechanical Engineering Students (GAMES) gave us a tour in the building of Mechanical Engineering and over the campus. It was nice to see the differences between the McGill University and the TU Delft.

Besides the visits to the companies and the university, there was some time to discover the Canadian life. First of all, the wonderful nature as seen by the Niagara Falls and during the trip to the Big Chute Marine Railway. Another experience was climbing the CN Tower, with a height of 553 meters. And of course some sportive activities, like rafting on the Rouge River (Québec) and visiting the baseball match between the Toronto Blue Jays and the New York Yankees.

After months of preparation, we can look back on a very successful tour! We want to thank our board of recommendation, our sponsors, the visited companies and last but not least our enthusiastic participants for their contribution to this tour! ■

The Study Tour Committee (from left to right):
Steven Goudswaard
Martijn van der Pouw
Robin Voorend
Sander Kleinheerenbrink
Jos van der Geest

Dispuut Transportkunde

Board of Recommendation

Prof.dr.ir. J.T. Fokkema
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President Executive board, Delft University of Technology

Prof.drs. M. Waas
Dean Faculty 3mE, Delft University of Technology

Prof.ir. J.C. Rijsenbrij
Professor Large Scale Transport Systems, Delft University of Technology

Prof. dr. ir. G. Lodewijks
Professor Transport Technology and Logistics Technology, Delft University of Technology

Sponsors

We would like to thank the following companies and organisations for their financial support

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Participants


F.J. (Frans) van Brenk


B. (Bastiaan) de Bruin


F.T. (Frank) Brussaard


K. (Koen) Davina


J.T. (Jos) van der Geest


S.A. (Steven) Goudswaard


A.J.A. (Sander) Kleinheerenbrink


D.L. (Daniël) Mooijman


M. (Martijn) van der Pouw


B.J.A. (Bob) Riemslag


P. (Peter) Rodenburg


P. (Paul) Stoop


G. (Gerard) van der Veen


R.H. (Rick) van der Vegte


C. (Carla) Velraeds


F.E.H. (Sander) Verkade


B. (Bob) Vermeer


B.J. (Bart) de Vette


R.S. (Roel) Vissers


W.N. (Wim) Vlaar


R. (Robin) Voorend


N. (Nick) Warmerdam

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Corporate Reports

Siemens Power Generation

Date: Monday 11th of may
Contact person: Katie Walton
Adress: Siemens Canada Ltd.
30 Milton Avenue
Hamilton ON L8L 6E6
CANADA
Phone: +1 (905) 528-8811

New Forest Paper Mills

Date: Tuesday 12th of may
Contact person: Ed Stapleton
Adress: New Forest Paper Mill
333 Progress Avenue
Scarborough ON M1P 2Y9
CANADA
Phone: 416-298-8101

Molson Canadian Brewery

Date: Tuesday 12th of may
Contact person: Wynne Ann Vardy
Adress: Molson Brewery Toronto
1 Carlingview Drive
Etobicoke ON M9W 5E5
CANADA
Phone: 416-675-1786

EMS-Tech Inc.

Date: Wednesday 13th of may
Contact person: John Elder
Adress: EMS-TEch Inc. Head Office
699 Dundas Street West
Belleville ON K8N 4Z2
CANADA
Phone: (613) 966-6611

Lauzon ltd. Sawmill

Date: Thursday 14th of may
Contact person: Pierre Levasseur
Adress: Lauzon ltd. Sawmill
175 Rue Alexandre
Thurso QC J0X 3B0
CANADA
Phone: (819) 985-0600

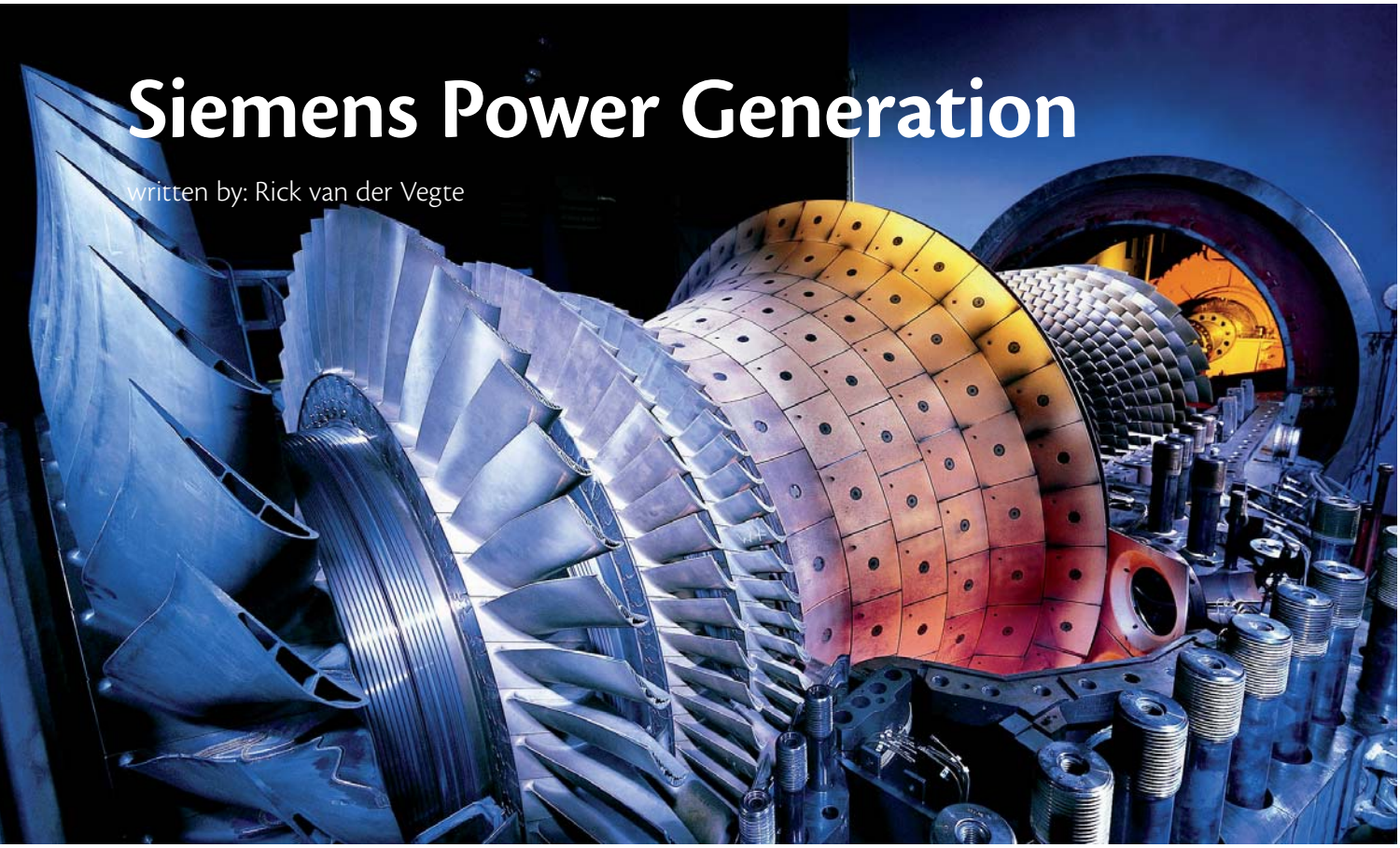
Wal-Mart - Supply Chain Management Inc.

Date: Fryday 15th of may
Contact person: Veronique Slijkhuis
Adress: Supply Chain Management Inc.
2401 SCM Way
Cornwall ON K6H 5R5
CANADA
Phone: (613) 936-8676

Dispuut Transportkunde

Siemens Power Generation

written by: Rick van der Vegte



SIEMENS

Changes in today's energy markets are presenting power producers worldwide with new challenges. Today, it is more important than ever to find new solutions that provide a fast return on investment without sacrificing long-term reliability and flexibility. Siemens Gas Turbines meets these requirements with high-tech power generation systems. Siemens' latest development, the new 340 MW gas turbine, is designed to achieve more than 60% efficiency in combined cycle operation. This highly engineered piece of equipment made us want to visit the Hamilton production plant of Siemens' power generation division.

The Hamilton production site produces gas turbines for the North American market. 60 Hz turbines are build with high precision from which the engineering experience dates back to 1896, when Westinghouse started producing airbrakes in Hamilton. After several years a large diversity of electronic equipment was being build in the same plant because of overcapacity. Another couple of years later, Westinghouse came back to its' original field of expertise and started building gas turbines. In 1998, Siemens took over Westinghouse and since then the capacity has increased to 65 turbines a year with about 670 employees working at their plant

The visit consisted of:

- An introductory presentation, which explained the core business and competences of the Hamilton plant
- A tour through the production facility, under the guidance of several experts
- A visit to a small –in-site – museum. This museum shows the history of Westinghouse and gives more information about the gas turbines produced in Hamilton.

The product

First the working principle of gas turbines will be given. After that the layout of the plant seems extremely well thought out and reasonable. A gas turbine mainly consists of three parts:

- The rotary parts
- The static parts
- The housings and side equipment

Air is compressed in several stages by letting it flow through compressors, when at the right pressure after compression, combustion can take place and expansion of the produced – high temperature – exhaust gas generates the rotary movement needed to drive the compressor. Because energy is added in the combustion stage, extra rotary energy is available for power generation. After each flow stage through a rotary part, the airflow is corrected by a static part. The rotary parts are produced at one side of the facility and the stator parts are produced at the other side of the facility. In-between the housings and side equipment are fabricated. When in their final stage, the components can be assembled in the assembly hall.

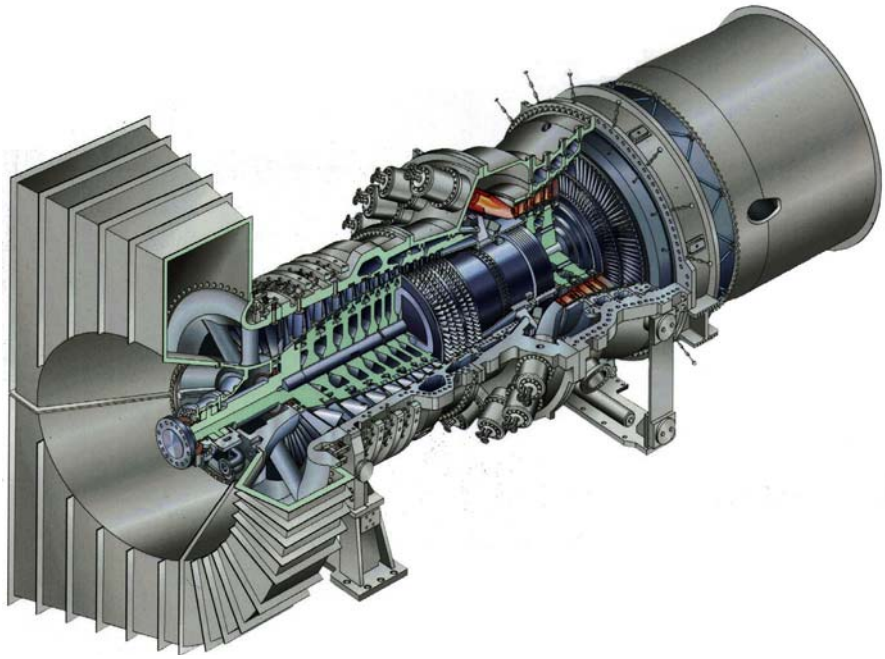
Rotary parts

Each stage of compression or expansion is represented by a number of blades assembled on a disk. The disks, coupled together with a patented coupling system, form the single shaft design. All disks are assembled in erected state, so this can be done with ease and high precision. After all the disks are coupled together the entire system will be turned horizontally and aligned. After aligning, the blades are assembled stage by stage, while being balanced between every stage. The rotary

parts are kept rotating as much as possible during assembly to prevent bending due to the weight of the rotor.

Static parts

The stator is produced in much the same way, though it is much easier because balancing is not needed at this point. Nevertheless high accuracy welding is needed to provide an efficient air flow. The use of mechanically adjustable compression stator blades, gives the user the ability to adjust the airflow to meet an optimum. This, combined with a new compressor with advanced blade design, the use of advanced materials to increase the firing and exhaust-gas temperature, an advanced sealing system for low-leakage of cooling air and a high-pressure combined cycle process gives the stator an efficiency of up to 60%.



Siemens

Cut of a 340 MW Siemens gas turbine

Housings and side equipment

Because gas turbines operate at extremely high temperatures the housings have to be cooled. The production of the housings and exhausts is done by laser cutting thin plates. When combining different laser cut plates with different patterns by pressing them together, internal air ducts are created. These ducts give the possibility to cool the parts automatically because of suction caused by the exhaust stream. Even with a housing which is cooled very well, temperatures can still increase above the limits of the used materials. This is why every part is coated and treated to be able to withstand the extreme operating conditions.

Since the flow of air in the compressor and expansion stages needs to be controlled with high accuracy to achieve a well operating gas turbine, a high production accuracy is needed as well. Siemens is able to provide the needed accuracy by using laser welding. Though laser welding isn't used in all cases, for the larger welds highly educated personnel is used to make the welds by hand. This gives, besides the needed accuracy, an extra check on the quality of the products.

Quality is very important when dealing with gas turbines. Turbines are operating at the limits of engineering possibilities and any accident has to be prevented. This awareness is present with any employee and gave Siemens among many others a DIN ISO 9001:2000 certificate. The knowledge with which Siemens is working is also reflected in the use of the Six Sigma approach. This approach is being used in the complete production and supply chain.

In short: Siemens showed us a production site which is producing with a high accuracy, with a high efficiency and which not only has a deliberated layout but which is also lean and complies with the latest developments and trends. A very welcome tour for logistical engineers. ■

Siemens

Assembly of the rotary parts

Siemens

Stator parts are assembled with high accuracy

New Forest Paper Mills

written by: Bob Vermeer

Dispuut Transportkunde

New Forest Paper Mills (NFPM) is a joint venture of Atlantic Packaging and Mitchel-Lincoln Packaging. With over 20 manufacturing and distribution facilities and a large truck fleet it is the largest private sector employer in Scarborough, Ontario.

New Forest Paper Mills

New Forest produces 100% recycled paper for corrugated boxes used in the food and beverage industry along with a diverse range of other products. The state-of-the-art mill opened in 2006 adjacent to Atlantic Packaging headquarters in east-end Toronto.

It is the first containerboard paper mill to be built in Canada in 25 years and one of the most ecologically advanced facilities in the country.

Even though the last car arrived somewhat late (~20 minutes), since they were navigationally challenged, we quickly started the presentations to make up for lost time.

The time schedule for the day:

- 9:20 General introduction
- 9:25 Sustainability Discussion
- 10:00 Deeper into NFPM
- 10:45 Excursion through the paper mills

We were welcomed by Gerry Murray, the site manager of NFPM, he introduced us to several of his staff members. After that he quickly dove into a presentation about how sustainability is handled at NFPM.

It was refreshing to visit a company where they start off with sustainability issues and how they handle them. Instead of it being handled at the end of the presentation, after everything else has been said and done. It was clear that sustainability was the number 1 priority of NFPM.

Some measures they've taken to reduce their carbon footprint include;

- Methane gas is recovered from wastewater treatment, reducing 5-10% of Natural Gas requirement.
- Clay is recovered from recycle waste (to be used for Portland cement making) reducing 30% of the Natural Gas requirement.
- Their Whitby mill steam is 100% supplied from a Cogeneration Electricity Generator.

The fact they are actively handling their sustainability issues didn't go unnoticed!

"New Forest Paper Mills won a silver award for environmental performance in the Packaging Association of Canada's (PAC) first annual Sustainable Packaging Awards."

After the sustainability discussion Gerry talked about all the processes involved in the paper making process. The whole process can be divided into roughly 4 separate steps.

Pulping

Bales of Old Corrugated Cardboard (OCC) are fed into the pulper. The pulper blends the recycled OCC with water to form a pulp slurry.

Long stringy material is removed by inserting a rope into the Pulper (the so called "Ragger").

Large Contaminant Removal

After the pulp slurry is formed, the next step is to remove the bigger contaminants. The biggest parts are removed with a grappler. Throughout the years they've removed some peculiar items from the pulp. Think of items such as bowling balls or car parts (you get paid by the weight of the OCC you hand in).

The next step is to remove the 'medium' sized contaminants, this is done by several filter machines, with each machine designed to filter a specific type of conta-

minant. Think of such things as;

- pieces of wood
- pieces of plastic
- nuts and bolts
- glass

Fine Contaminant Removal

By now the pulp still isn't 'finished', every minute contaminant will show up on the paper. So the next step is removing the small contaminant particles, this is achieved by using high speed centrifugal filters.

Particles removed in this step include;

- styrofoam
- glue
- wax
- fragments of plastic

Creating the paper

Now that the pulp is clean, the actual paper making process can begin. Two thin layers of pulp are sprayed onto a fine mesh conveyor.

The two thin layers are pressed together between two big rollers covered in felt. After the joining of the two layers, the paper passes 37 dryer 'cans', in order to reduce the moisture content of the paper from >75% to around 7%.

Following this process the paper passes two hot steel rolls, to finish or 'calender' the top sheet of the paper. This enhances the printing characteristics as well as smoothing out the surface.

The paper is now ready to use, the NFPM manages to produces over 1000 metres of paper every minute. The finished product is rolled up onto huge reels, each weighing roughly 18 tons. After that each reel is rolled into smaller rolls of paper, generally 3 sets of 2 rolls.

After getting an insight in the paper making process, we visited the actual paper mill itself. Where we could see all the steps previously explained in practice.

The actual paper mill was pretty impressive to see 'in action', a behemoth of a machine, roughly 7 metres wide, 10 metres high and 60 metres long. Producing over 700 Metric Tonnes of fresh recycled paper every day. ■

Dispuut Transportkunde

Joining of the two pulp layers


Dispuut Transportkunde

A ragger


Dispuut Transportkunde

Full reel weighing 18 tons


Dispuut Transportkunde

Bales of Old Corrugated Cardboard

Molson Canadian brewery

written by: Carla Velraeds

Dipuut Transportkunde

Company information

Canada's oldest brewery was founded in 1786 in Montreal, by John Molson. Nowadays Molson is the oldest consumer brand name in Canada, the oldest beer brand in North America and the fifth biggest beer brewery in the world. They have more than 3,000 employees across Canada and their biggest market is in Canada, the United Kingdom and the United States of America. Molson operates six breweries across Canada, located in Montreal, Toronto, Creemore, St. John's, Moncton and Vancouver. Molson Canada is a part of the Molson Coors Brewing Company.

Molson has a lot of different brands, for example, Coorse Light, Canadian and Molson dry. In comparison with the United States the Molson brewery recycles a lot of their bottles and cans, 98% of the bottles and 95% of the cans are recycled.

At the Molson brewery they have high standards according to excellence; this all started a long time ago with the six principles of John Molson for brewing success; experience, human touch, details, consistency, innovation and community.

During our visit

During our fourth day in Canada we had the honour to visit the Molson brewery in Toronto. Mr. D. Bendiak, PhD. gave us a great tour through the brewery and packaging factory. The brewing and packaging part of the factory are connected underground, this is done so they can transfer the beer without going outside during Canada's cold winters.

In the Molson brewery of Toronto 4 millions of hectolitres of beer are produced every year, all in bottles and cans. The two other big breweries are in Montreal and Vancouver which produce respectively 3.2 millions and 800,000 hectolitres of beer a year.

To produce such large quantities of beer, they need a lot of fresh malt, therefore each day 3 shipments of malt arrive.

First of all we looked at the brewing process, where Mr. D. Bendiak, PhD. gave us a very clear overview of the process.

After that we went to the packaging factory, which was for us, Transportation Engineers, the more interesting part of the tour. It was a nice experience because it was possible to come very close to all the machinery. Most of us had probably already seen a packaging process of another brewery, but not from this close, which made the experience even better. To tell us more about the working principle the process was sometimes even stopped to explain things in more detail. The beers are packed in bottles or cans and after that they are packed in boxes, this whole process is fully automated. In the packaging factory they also fill kegs of 20 and 58 litres for bars, this is only a small part of the total distribution.

Further information

After the tour we went to a meeting room where two other employees were waiting for us. We could ask them all our questions regarding the further transportation of the end product.

Typical of the beer industry in Canada is that it is regulated by the provincial governments; these governments have a monopoly on beer distribution and the retail of beer sales. Each province has its own agency, which is responsible for regulating the sale and consumption of beer. To be more precise, the government regulates the pricing, mark-up, container management, sale, distribution and advertising of beer. One conclusion form this is that Molson does not have to plan its own

transportation, the Beer Store optimizes the transport plan of all breweries.

Distribution

In Ontario there are parallel beer distribution systems. Beer may only be purchased at retail outlets operated by Brewers Retail (BR) or at governmental regulated retail outlets operated by the Liquor Control Board of Ontario (LCBO). Every bar and restaurant in Ontario must be licensed by the LCBO to sell liquor. Nowadays there are 19,000 licenses (this includes bars and restaurants) and 440 bulk retail stores. From this there are 450 stores established in Ontario. All brewers have to pay a listing fee according to there sales volume.

Dispuut Transportkunde

Beercans on a belt conveyor

Dispuut Transportkunde

Mr. D. Bendiak during our tour

Dispuut Transportkunde

One of the Brew kettles

This makes it very difficult for small breweries, most of the time it is a waste of money and time, therefore small breweries promote their beers locally. When paid the listing fee the brewery must obey a few requirements of packaging, labeling, pricing etc.

The governments decide whether a new Beer Store will be opened in a growing district; this will take approximately 5 years. The long waiting time doesn't matter for Molson, since their competitors have to wait as well. It's only inconvenient for the consumer. ■

Dispuut Transportkunde

Many loaded pallets were stored waiting to be picked up

EMS-Tech Inc.

written by: Gerard van der Veen

Dispuut Transportkunde

A World Leader in the Design and Supply of Bulk Material Handling and Storage Systems

Company profile

For more than 20 years Ems-Tech Inc. is a Canadian Engineering firm privately owned by business owners Peter Sorensen and Brian Stafford. EMS-Tech Inc. continues to grow as a world leader in the design and supply of mobile bulk material handling systems on a global basis. Today EMS-Tech has grown to an organization of 60 employees. A multi-disciplined engineering team consisting of experts in the field of engineering, design, manufacturing, purchasing and management of custom designed bulk material handling equipment. They have developed a strong supply chain management capability and a worldwide network of partners in the supply of fabrication services and specialized parts, the company is able to provide cost optimized solutions for projects anywhere in the world.

EMS-Tech Inc. thrives on new challenges, technological advancement and meeting clients' value needs. They are continually searching for practical, economical and reliable solutions to complex problems. This is the reason why EMS-Tech would be the perfect place for us to be presented with a case.

The strength of the company resides in competence, integrity and depth of customer relationships world wide. Their primary objective is to complete projects on time and within budget and to continually meet client's goals and objectives; EMS-Tech strives in its ambition to offer realizable value to its client base over the life cycle of a project. This has resulted in sustainable business growth through referral and repeat business from satisfied customers across a diverse range of industries and geographic locations around the world. Since its inception in 1988, repeat business has generated steady growth for EMS-Tech Inc.

EMS-Tech is specialized in the following engineering disciplines: structural, civil, mechanical, welding and electrical. There are two separate markets of material handling where EMS-Tech is active: marine based and land based material handling.

EMS-Tech

Life cycle of a project

Marine based material handling

It is focussed on a particular breed of ships, namely the self-unloader. These ships incorporate material handling systems that allow them to off-load material without shore-side assistance. EMS-tech is a world leader in the design and supply of self-unloading systems.

Land based material handling

EMS-tech has aggregated over 700 years