Our future workforce

Flemming Dahl, Senior Vice President and Head of Quality, Novo Nordisk
Who am I...?

Head of Quality in Novo Nordisk

48 years
Danish
Married
5 Children [7-19]
Free time: soccer, cycling and my family

Chemical Engineer

22 years with Novo Nordisk

- Production chemist
- Department Manager, Purification Plant, Diabetes API, Product Supply
- Vice President, Diabetes API, Product Supply
- Senior Vice President, Biopharm, Product Supply
- Senior Vice President, Corporate Quality
- Head of Quality
The current situation at Novo Nordisk

Novo Nordisk share price development in 2016

-40% YTD
Novo Nordisk at a glance

- a Danish-based global healthcare company
- 90 years of innovation and leadership in diabetes care
- Haemophilia, growth disorders and obesity.
Global presence

5 REGIONAL HEADQUARTERS
CHINA, PACIFIC, EUROPE, US AND IO

5 STRATEGIC PRODUCTION SITES
BRAZIL, CHINA, DENMARK, FRANCE, US

3 R&D CENTRES
CHINA, DENMARK, AND THE US

DENMARK GLOBAL HEADQUARTERS
75 NOVO NORDISK AFFILIATES
180 COUNTRIES WORLDWIDE

NOVO NORDISK MARKETS ITS PRODUCTS IN
It is all about the patients...

“Children should not get diabetes in the future”

JENNIFER ANTHONY
Jennifer has type 1 diabetes and lives in India
The Novo Nordisk Way

Our ambition is to strengthen our leadership in diabetes.

We aspire to change possibilities in haemophilia and other serious chronic conditions.

Our key contribution is to discover and develop innovative biological medicines and make them accessible to patients throughout the world.
The Triple Bottom Line is how we do business...

Financially responsible - profitable in the long term

Socially responsible - helping people live better lives

Environmentally responsible - minimising negative impacts

- profitable in the long term
- helping people live better lives
- minimising negative impacts

how we earn money
how we spend money
short term profitability
long term profitability

patients
employees
communities

water
energy
waste
CO₂

How many of you know someone with diabetes?
Diabetes – type 2

Type 2 diabetes develops when the beta-cells in the pancreas start to become inefficient and produce too little insulin for the body’s needs.

Insulin is a hormone that controls blood sugar levels.
Diabetes – type 1

Type 1 diabetes develops when a person’s pancreas stops producing insulin altogether.

Without immediate treatment, people living with type 1 diabetes can die.

“Children should not get diabetes in the future”

JENNIFER ANTHONY
Jennifer has type 1 diabetes and lives in India
Is obesity a disease?
Obesity

Obesity is an abnormal or excessive accumulation of fat that may impair health.

Obesity is generally defined at a population level as a BMI* of 30 or over.

*Body Mass Index (BMI) is a measure of body composition. BMI is calculated by taking a person's weight and dividing by their height squared.
Diabetes and Obesity is a very competitive market...

Notes: Only companies with marketed products and global presence are included
Sources: Competitive Intelligence, May 2016
What does it take to develop a drug? Cost? Time?
From idea to patient

Industry estimates that out of 10,000 ideas that begin in the lab, just 10 will ever reach the stage where they are tested on people. Out of that, one may reach the market.

The process normally takes 10 to 15 years from initial work in the lab until a product is launched on the market.
The journey: 10-15 years from idea to patient

1 in 10,000 ideas make it to market. The average estimated development costs of a final drug is around USD 1.3 billion.
Innovation is key...
Novo Nordisk has a rich pipeline

Source: Strategic R&D, data extracted on 09 September 2016
Innovation example:
GLP-1/liraglutide/Victoza ®
Engineering work is key to success

- Continuous improvements:
  - Minimizing time used for not value adding activities
  - Optimizing usage of purification steps
  - Maximizing utilisation of pumps, vessels and equipment
  - Optimizing cleaning procedures

- Result:
  - Capacity optimized 250%
  - Yield maximized with more than 50%
Innovation example: Biologics in a tablet

- Novo Nordisk is researching the holy grail – biological medicines in a tablet. It has been pursued for a 100 years – and we have failed a couple of times.

- Oral semaglutide is to be the first protein-based medicine in a tablet.
Critical talent at Novo Nordisk

- IT/Automation Engineers
- Mechanical/Chemical Engineers
- Health Economists
- Medical Doctors
- QA/IT Specialists
- Biostatisticians

Source: Novo Nordisk Quarterly Talent Brief, August 2016
AND…. there is a global cry for engineers across industrial sectors

*Source:* ManpowerGroup, 2015 Talent Shortage Survey
Why is it difficult to fill jobs?
<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of available applicants/no applicants</td>
<td>35%</td>
</tr>
<tr>
<td>Lack of technical competencies ('hard skills')</td>
<td>34%</td>
</tr>
<tr>
<td>Lack of experiences</td>
<td>22%</td>
</tr>
<tr>
<td>Lack of workplace competencies ('soft skills')</td>
<td>17%</td>
</tr>
<tr>
<td>Looking for more pay than offered</td>
<td>13%</td>
</tr>
</tbody>
</table>

**Source:** ManpowerGroup, 2015 Talent Shortage Survey
Does this matter at all for Novo Nordisk?
Example:
The lack of engineers in Denmark

Note: Civil and Diploma Engineers
Source: Engineer The Future, Prognosis for lack of engineers and candidates in natural sciences, May 2015
GLOBAL DEMAND TRIGGERS MAJOR PRODUCTION INVESTMENTS

In 2015, Novo Nordisk announced plans for major investments in new production plants.

Manufacturing proteins, such as insulin, is a highly sophisticated task. While other pharmaceuticals are manufactured through a series of chemical syntheses, proteins are bigger, more complex molecules, and producing them relies on large investments in sterile production facilities and an understanding of working with living cells, such as yeast, to produce a pure, uniform product.

“Novo Nordisk is the world’s largest producer of insulin and has developed its

MEETING GLOBAL DEMAND

The year 2015 was an exciting time for Product Supply, as Novo Nordisk announced several plans for major investments in production plants over the next five years. This will also be evident from Novo Nordisk’s accounts in the coming year, according to Novo Nordisk’s chief financial officer, Jesper Brandgaard. Commenting on investments at Novo Nordisk’s Capital Markets Day in November 2015, he said: “Demands to support future product supply are rising, and we expect increasing demand for Novo Nordisk’s products, which is mainly driven by the growing

Among other major expansion projects announced in 2015 is a filling facility in Hillerød, Denmark, which will produce medicines for the treatment of diabetes and obesity. This 10,300 m² production facility is expected to be operational in 2019 and will add 450 new production and engineering jobs to the 1,900 jobs already there.

A further 100 new jobs will be created at a new drug product plant in Måløv, Denmark. Novo Nordisk plans to invest 2 billion US dollars in these two facilities in the next five years.
Ongoing expansions in Denmark

press release

Novo Nordisk invests DKK 400 million in an expanded production plant in Kalundborg

Bagsværd, Denmark, 4 July 2016 - Novo Nordisk is investing 400 million Danish kroner in an extension of the world’s largest insulin production plant in Kalundborg.

“The expansion of our production plant highlights our ambition to continue strengthening our presence in Kalundborg. The new facilities will give us greater flexibility and enable the installation of equipment that will enhance efficiency and increase the long-term production capacity of the plant,” says Michael Halgren, senior vice president and head of production in Kalundborg.

Established in 1960, the Kalundborg production site today covers a total area of 1.1 million square metres. With its 3,400 employees, Novo Nordisk Kalundborg is a cornerstone of Novo Nordisk’s global production and produces 50% of the world’s insulin as well as a range of non-pharmaceutical products.

Groundbreaking for the plant extension will take place today and the extension is expected to be completed at the end of 2018.

04 Nov 2015 08:56 CET

Novo Nordisk invests DKK 2.1 billion in new insulin filling facility in Denmark, creating 450 new jobs

Bagsværd, Denmark, 4 November 2015 - Novo Nordisk is investing 2.1 billion Danish kroner in a new 10,300 m² facility in Hillerød, Denmark. The facility will produce medicines for the treatment of diabetes and obesity.

A groundbreaking ceremony marking the start of construction work will be held today, Wednesday 4 November, at the company’s Hillerød site, attended by the mayor of Hillerød, Dorte Meldgaard.

The facility is expected to be operational in 2019 and will create 450 new production and engineering jobs in Hillerød, where Novo Nordisk already employs 1,900 people.

Incorporating the latest state-of-the-art insulin production technology, the new insulin filling facility will ensure production capacity for existing and future products within diabetes.

“The investment in Hillerød underscores our long-term ambition to create and maintain jobs in Denmark. This year alone we have created 1,000 new jobs in Denmark, of which 500 are in production, primarily in Kalundborg and Hillerød,” said Henrik Wulff, executive vice president and head of Product Supply, Novo Nordisk.
In the US, we are expanding our production capacity and we need engineers...

press release

Novo Nordisk breaks ground on USD 2bn production facility in Clayton, North Carolina


The facility will produce active pharmaceutical ingredients (API) for a range of Novo Nordisk’s current and future GI and insulin products. Once fully operational in 2020, Clayton will ensure production capacity for diabetes care products in the US for the decade ahead.

“As the prevalence of diabetes has grown in the US, so too has the demand for effective treatments,” said Lars Bahner Reinhart, president and chief executive officer of Novo Nordisk. “It gives me great pride to break ground on our new facility site in Clayton volume and human.Tablet, among others. This site will play a vital role in enabling us to meet the needs of people living with diabetes in the US for years to come.”

The new site is situated adjacent to Novo Nordisk’s existing 42,000 m² facility which assembles and packages Flexpen™ and FlexTouch™ prefilled insulin devices for the US market. The expansion is expected to create jobs by 700 new jobs, and Novo Nordisk expects to create a significant employment effect during the construction period with up to 2,000 people working on the project at its peak.
We need
ISPE to...
We need ISPE:

- Bring **political attention** to the need for engineers
- Stimulate **positive public discussion** around the field of engineering and
- **Lead by example:** engineers are crucial in solving global challenges in a sustainable way
- **Share modern complexities of hiring** specialists, generalists and everybody in-between
- Build **pride within our profession**
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