DTU Campus Service (CAS)

Building a full circle FM organisation at DTU

Jacob Steen Møller, MSc., PhD.
Director of Facilities

CIB Facilities Management Conference, 21 May 2014
About DTU
DTU Key Facts

Nøgletal 2013
Antal studerende  ca. 10.000
Ph.d.-stud.  ca.1.200
Ansatte  ca.4.500
Publikationer  ca. 4.100

Ranking
Leiden Ranking 2013:

nr. 1 i Norden
nr. 7 i Europa
DTU History

- The College of Advanced Technology was established by H.C. Ørsted in 1829.

- Moves to **new campus in Lundtofte in 1963**. Official inauguration in 1974

- Changes name in 1994 to Technical University of Denmark

- **2001: Autonomy over management and buildings** with a board of directors with external majority and board appointed management.

- In 2007, DTU merges with Risø, Danish Food Research, Danish Institute for Fisheries Research, Danish National Space Center and Danish Transportation Research

- In 2013, DTU merges with Copenhagen Engineering College

*H.C. Ørsted*
DTU’s two FM stories
CAS business model and organisation
Strategic Anchors

DTU’s Vision, Mission and Strategy

The Institute’s Strategy (UMV)

Sectional Action Plan

Individual Goals (Employee Development)
DTU Strategy: Visions for Campus Development

- DTU will be recognized and respected globally as a leading elite technical university. Therefore DTU will **develop its facilities to the highest international standard.**

- DTU will strengthen Life Science. Therefore the master campus plan includes a **bio-engineering center** at DTU Lyngby Campus.

- DTU offers **unique research infrastructure**. Therefore the master campus plan includes a plan for world class research infrastructure.

- DTU places the utmost importance on the **experimental and innovative aspects** of its educational programmes. Therefore the master campus plan includes further development of **learning environments to the highest international level.**

- DTU recognises the quality of its campus as a decisive international competitive parameter. Therefore DTU **gives priority to a beautiful and functional campus with an evident and diverse social campus life.**

- DTU takes on the responsibility to support sustainability as a national competence. Therefore **DTU campus development and operation must be sustainable.**
Campus Service – CAS Strategy, Mission og Vision

**Strategy**

1. “DTU’s infrastructure shall support education, research, consultancy and innovation
2. “DTU shall prioritize an attractive and functional campus with a visible and versatile social life, including an enjoyable student environment.”
3. “DTU’s administration of its functions as an autonomous institution shall be developed into a prime example of efficient university operation.”

**Mission**

CAS is DTU’s Facility Management organization. CAS shall ensure that operations, maintenance and development of DTU’s buildings, areas and facilities support DTU’s core activities, i.e. research, education, innovation and consultancy, in the best possible manner.

**Vision**

CAS shall ensure that DTU’s campus, building complex, facilities and related service are nationally and internationally attractive, and CAS shall be a leader in its contribution to the improvement of current standards.
Facility Management Circle

PORTFOLIO (Property)

Decisions
- Acquisitions
- Rentals
- Construction

Planning
- Needs Assessment
- Prognoses
- Scenarios

Facilities Management

Construction
- New Constructions
- Renovation
- Expansion

SPACE MANAGEMENT

CONSTRUCTION

Operations
- Utilities
- Administration
- Maintenance
- Services

OPERATIONS AND MAINTENANCE
Business model aligned with economic model
Campus Plan

Why?
Campus Plan
Architectural Basics
Lucio Costa
Oscar Niemeyer
1956-1960
Background

• Koppel & Nørgaard 1959-1974
• Planning competitions
• CAS

+ DTU Values

• DTU strategy
• Global network hub
• Lyngby knowledge city
• Sustainability
• Pragmatic approach
Campus Plan
Architectural Basics

1 / Main Structure
2 / Hierarchy
3 / Park & landscape
4 / Buildings
5 / Traffic
1 / Main Structure

- Avenue
- Bastions
- Quadrants
2 / Hierarchy

- Centres, sense of location
- Denser meeting spaces
3 / Park og landskape

- Edge of wood
- Park
- Square
- Garden
4 / Buildings

- Free forms and facades
- Energy optimisation
- Inviting
- Taller
5 / Traffic

- Parking
- Bicycles
- Light rail
Campus Plan Objectives
Campus Plan Objectives

1 / Co-locate
2 / Bio-engineering center
3 / Growth
4 / Research Infrastructure
5 / Learning Environment
6 / Efficiency
7 / Sustainability
<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn over (Mkr)</td>
<td>3.483</td>
<td>4.244</td>
<td>5.101</td>
</tr>
<tr>
<td>(%/year)</td>
<td></td>
<td>6.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Man years (My)</td>
<td>4.288</td>
<td>5.031</td>
<td>5.700</td>
</tr>
<tr>
<td>(%/year)</td>
<td></td>
<td>5.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Student work years (STy)</td>
<td>4.259</td>
<td>4.979</td>
<td>10.000</td>
</tr>
<tr>
<td>(%/year)</td>
<td></td>
<td>5.3</td>
<td>3.5</td>
</tr>
<tr>
<td>Area (brutto m2)</td>
<td>519.283</td>
<td>523.638</td>
<td>567.810</td>
</tr>
<tr>
<td>(%/year)</td>
<td>0.3</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Turn over/Area (kr/m2)</td>
<td>6.707</td>
<td>8.105</td>
<td>8.983</td>
</tr>
<tr>
<td>Area/My</td>
<td>121</td>
<td>104</td>
<td>96</td>
</tr>
<tr>
<td>Area/STy</td>
<td>122</td>
<td>105</td>
<td>72</td>
</tr>
<tr>
<td>Area/(My+STy)</td>
<td>61</td>
<td>52</td>
<td>41</td>
</tr>
</tbody>
</table>
2 / Bio-Engineering Centre

- DTU Food Mørkhøj
- DTU Aqua Charlottenlund
- 750 employees
- 39,000 m²
- DTU Vet Frederiksberg
- DTU Vet Lindholm og Aarhus
4 / Research Infrastructure

- Powerlab
- Geo-lab
- Audiovisual lab
- E-learning
- Research vessel
5 / Learning Environment

- 324
- Auditorierenovering
- 127
- 101 Bibliotek
7 / Sustainability
CAS in an open world
CAS in an open world

1 / Construction
2 / Shared Facilities
3 / Research
4 / Innovation
5 / Education
6 / Demonstration
7 / Society
8 / Environment
Conclusions
Building projects
Projects, Lyngby Campus
Area:
B.201: 6.670 m²
B.202: 27.350 m²
B.204: 6.690 m²
B.205: 6.790 m²
Total: 47.490 m²

Budget:
201: 70 mio. kr.
204: 70 mio. kr.
202: 850 mio. kr.
205: 300 mio. kr.
Total: 1.3 mia. kr.
DTU Biosustain B.220

Areal 12.000 m2
Budget: 300 mio. kr.
DTU Compute og learning space B.324

Areal: 4600 m²
Budget: 100 mio. Kr.

Foto: Stamers Kontor
DTU Electro B.325, B326, B.3289 og B.329A (Agora)

Brutto Areal: 4070 m²
Budget: 73 mio. kr.
DTU Space B.328

Areal: 2.400 m²
Budget: 80 mio. kr.
DTU Fotonik B.340

Areal: 3800 m2
Budget: 120 mio. kr.
DTU Nanotech B.345S

Areal: 1140 m²
Budget: 34 mio. kr.
DTU Skylab B.373

Areal: 1550 m2
Budget: 25 mio. kr.
Sustainability
What is sustainability?

- Economic
- Social
- Environmental

Sustainability is a quality concept
Metode

Simulere → Handle → Måle
Systems understanding
(Houses are not islands)
Goal 16. Sustainability:

- DTU will reduce the total energy consumption per My+Sty by 15% from 2010 to 2015.
- DTU will increase recycling of waste from 35% to 40% from 2010 til 2015
Laboratories use a lot of energy
Energy use (MWh) pr. My + STy

Faktiske forbrug [MWh/STÅ + årsvejr]

Målsætning
Recycling of waste

Numbers on columns show amount in tonnes

- **Affald, ikke genanvendeligt**: Black bars
- **Affald, genanvendeligt**: Green bars

**målsætning for genanvendelses% iht målsætningskriterier**

<table>
<thead>
<tr>
<th>Year</th>
<th>Recycling of waste, not recyclable (tonnes)</th>
<th>Recycling of waste, recyclable (tonnes)</th>
<th>Recycling of waste (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,086</td>
<td>593</td>
<td>35%</td>
</tr>
<tr>
<td>2011</td>
<td>1,115</td>
<td>625</td>
<td>36%</td>
</tr>
<tr>
<td>2012</td>
<td>1,079</td>
<td>543</td>
<td>37%</td>
</tr>
<tr>
<td>2013</td>
<td>1,178</td>
<td>671</td>
<td>38%</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td>39</td>
<td>39%</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td>40</td>
<td>40%</td>
</tr>
</tbody>
</table>
Reduce area consumption

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn over (Mkr) (%/year)</td>
<td>3.483</td>
<td>4.244</td>
<td>5.101</td>
</tr>
<tr>
<td>Man years (My) (%/year)</td>
<td>4.288</td>
<td>5.031</td>
<td>5.700</td>
</tr>
<tr>
<td>Student work years (STy) (%/year)</td>
<td>4.259</td>
<td>4.979</td>
<td>10.000</td>
</tr>
<tr>
<td>Area (brutto m2) (%/year)</td>
<td>519.283</td>
<td>523.638</td>
<td>567.810</td>
</tr>
<tr>
<td>Turn over/Area (kr/m2)</td>
<td>6.707</td>
<td>8.105</td>
<td>8.983</td>
</tr>
<tr>
<td>Area/My</td>
<td>121</td>
<td>104</td>
<td>96</td>
</tr>
<tr>
<td>Area/STy</td>
<td>122</td>
<td>105</td>
<td>72</td>
</tr>
<tr>
<td>Area/(My+STy)</td>
<td>61</td>
<td>52</td>
<td>41</td>
</tr>
</tbody>
</table>
• Super Light Constructions
• Hybrid ventilation
• Low energy building
## Sustainability CO2 and kWh

Eksample: DTU LifeScience center

<table>
<thead>
<tr>
<th>Fraflyttede lokaliteter</th>
<th>Areal (m²)</th>
<th>el (kWh)</th>
<th>olie (liter)</th>
<th>gas (m³)</th>
<th>fjernvarme (kWh)</th>
<th>CO2 (kg)</th>
<th>Energi (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockefeller</td>
<td>3.962</td>
<td>313.512</td>
<td>-</td>
<td>-</td>
<td>502.255</td>
<td>189.985</td>
<td>815.767</td>
</tr>
<tr>
<td>Charlottenlund</td>
<td>5.431</td>
<td>233.198</td>
<td>-</td>
<td>67.381</td>
<td>-</td>
<td>274.941</td>
<td>974.389</td>
</tr>
<tr>
<td>Frederiksberg</td>
<td>16.717</td>
<td>1.630.274</td>
<td>20.000</td>
<td>92</td>
<td>1.983.710</td>
<td>983.030</td>
<td>3.814.996</td>
</tr>
<tr>
<td>Lindholm</td>
<td>13.048</td>
<td>2.326.427</td>
<td>547.358</td>
<td>-</td>
<td>-</td>
<td>2.521.339</td>
<td>7.800.007</td>
</tr>
<tr>
<td>Lindholm færgedrift</td>
<td>-</td>
<td>-</td>
<td>75.000</td>
<td>-</td>
<td>-</td>
<td>199.800</td>
<td>750.000</td>
</tr>
<tr>
<td>Århus</td>
<td>2.752</td>
<td>656.000</td>
<td></td>
<td></td>
<td>686.910</td>
<td>363.675</td>
<td>1.342.910</td>
</tr>
<tr>
<td>I alt</td>
<td>58.873</td>
<td>6.598.486</td>
<td>642.358</td>
<td>70.695</td>
<td>6.366.737</td>
<td><strong>5.495.506</strong></td>
<td><strong>20.166.448</strong></td>
</tr>
</tbody>
</table>

(342 kWh/m²)

<table>
<thead>
<tr>
<th>Samlokalisering</th>
<th>Areal (m²)</th>
<th>el (kWh)</th>
<th>olie (liter)</th>
<th>gas (m³)</th>
<th>fjernvarme (kWh)</th>
<th>CO2 (kg)</th>
<th>Energi (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bygning 328</td>
<td>3.785</td>
<td>185.740</td>
<td>-</td>
<td>-</td>
<td>191.700</td>
<td>102.711</td>
<td>377.440</td>
</tr>
<tr>
<td>Bygning 201-205A</td>
<td>30.921</td>
<td>1.488.210</td>
<td>-</td>
<td>17.518</td>
<td>1.200.745</td>
<td>835.554</td>
<td>2.881.648</td>
</tr>
<tr>
<td>Bygning 205B</td>
<td>3.000</td>
<td>399.344</td>
<td></td>
<td></td>
<td>263.336</td>
<td>206.991</td>
<td>662.680</td>
</tr>
<tr>
<td>I alt</td>
<td>37.706</td>
<td>2.073.295</td>
<td>-</td>
<td>17.518</td>
<td>1.655.780</td>
<td><strong>1.145.256</strong></td>
<td><strong>3.921.769</strong></td>
</tr>
</tbody>
</table>

(104 kWh/m²)

<table>
<thead>
<tr>
<th>Besparelse</th>
<th>Areal (m²)</th>
<th>el (kWh)</th>
<th>olie (liter)</th>
<th>gas (m³)</th>
<th>fjernvarme (kWh)</th>
<th>CO2 (kg)</th>
<th>Energi (kWh)</th>
</tr>
</thead>
</table>

Besparelse %: **79%** **80%**