Energy Saving and CO_2 Reduction Concept at Lufthansa Technik AG Hamburg

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Abstract:

Energy Saving and CO_2 reduction concept at Lufthansa Technik

In September 2007, Lufthansa Technik (LHT) – together with eleven other industrial companies in Hamburg and the Hanseatic city's environmental minister – signed a voluntary letter of intent to reduce its CO_2 emissions. The goal of this letter of intent is to encourage these Hamburg-based companies to optimize (on a voluntary base) their plant technology and production processes by 2013 in such a way that their energy consumption and thus also their CO_2 emissions will fall by more than 500,000 tons per year. Against this background, Lufthansa Technik has set itself the goal of reducing its current CO_2 emissions of 70,000 tons per year by at least 30 percent by modernizing its buildings and making the energy use in infrastructure and manufacturing processes even more efficient. To reach this goal, the Executive Board of Lufthansa Technik gave the green light in October 2007 for a comprehensive CO_2 reduction concept, which is also the basis for a long-term energy-efficiency strategy at the Hamburg location.

The concept is based on four fundamental principles:

- Avoiding waste of energy
- Implementing efficient use of energy (the human factor)
- To realize promising economic projects
- To realize projects with financial support of the government

By mid-2009, the energy consumption and the CO_2 emissions could be reduced by nearly 16 %. The public measures the image and credibility of a company and especially Lufthansa by ist efforts to reduce the emission of climate-relevant gases. Furthermore, demand for fossil fuels drives energy prices further and further up. Therefore, cutting back energy consumption is not only an ecological but also an economic necessity.

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Building Analysis

Lufthansa – Excellence in Aviation

Leading in international air transport

- More than 400 subsidiaries and associated companies
- Corporate headquarters in Cologne
- Hubs in Frankfurt,Germany
  Munich, Germany
  Zurich, Switzerland
- More than 108,000 employees
- Over 70 million passengers carried in 2008

Five business segments

- Passenger Transportation
- Logistics
- Maintenance, Repair and Overhaul (MRO)
- Catering
- IT-Services

Lufthansa Aviation Group

Revenue

Lufthansa There‘s no better way to fly **18.393 billion €** (27.222 billion $)

Lufthansa Technik More mobility for the world **3.717 billion €** (5.501 billion $)*

Lufthansa Systems Solutions for airlines **0.657 billion €** (0.972 billion $)

Lufthansa Cargo The business to business class **2.907 billion €** (4.302 billion $)

LSG Sky Chefs **The In-flight solution partner** **2.325 billion €** (3.441 billion $)

Lufthansa Corporate Data, 2008

*Lufthansa Technik AG and 19 consolidated subsidiaries

Key facts about Lufthansa Technik Group

- 26,000 employees worldwide
- 670 customers worldwide
- More than 450 commercial aircraft supported through Total Technical Support TTS®
- 2,000 aircraft supported under exclusive contracts

Key facts about Lufthansa Technik Group

- 60 line maintenance stations with Lufthansa Technik staff worldwide
- More than 1,700 aircraft checks are accomplished each day
- Global group of 32 subsidiaries and affiliates

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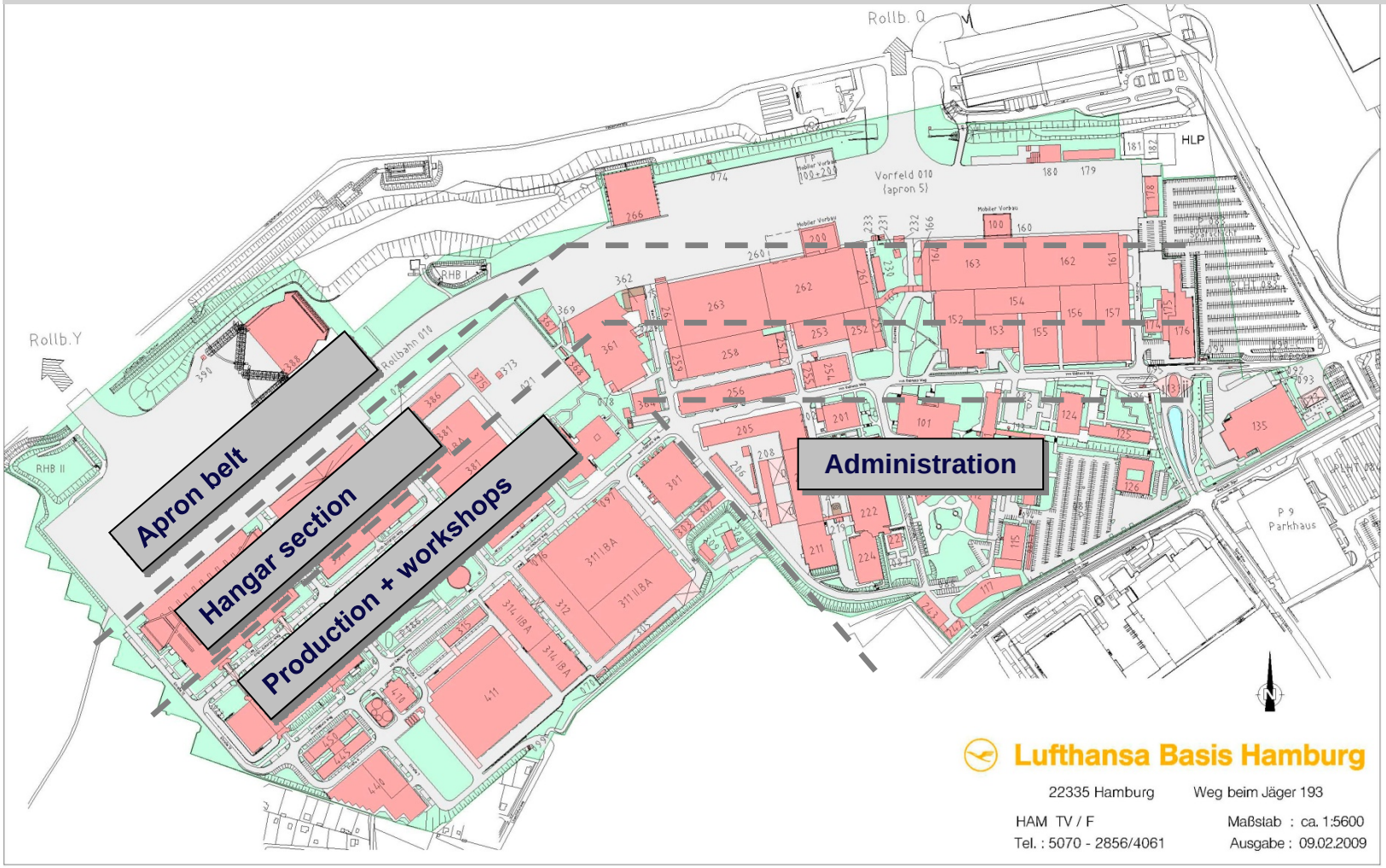
Lufthansa Technik Base, Hamburg, Germany

One of the largest MRO facilities in the world,
The Lufthansa Base is located at Hamburg Airport and covers 800,000 sqm (200 acres).

Site plan of Lufthansa Base, Hamburg, Germany



Key Figures for Lufthansa's Hamburg base

• Electric energy consumption p.a.	approx. 90 million kWh
• Gas consumption p.a.	approx. 107 million kWh
• Water consumption p.a.	approx. 230,000 m³ (300,000 cb. yard)
• Budget for construction p.a.	approx. 18 million € (26 million $)
• Budget Cost Centers for repairs p.a.	approx. 45 million € (64 million $)
• Buildings on-site and surrounding area	approx. 110 units
• Building standards ranges from office building to MRO hangar, *RSP* to high tech laboratories	
• HVAC network	approx. 3,100 units on-site
• Maintenance costs for HVAC network/p.a.	approx. 12 million € (17 million $)
• Visitors and employees on-site	approx. 9,000 persons/day
• Total parking lot capacity	approx. 5,500

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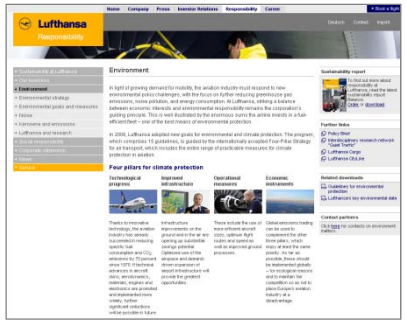
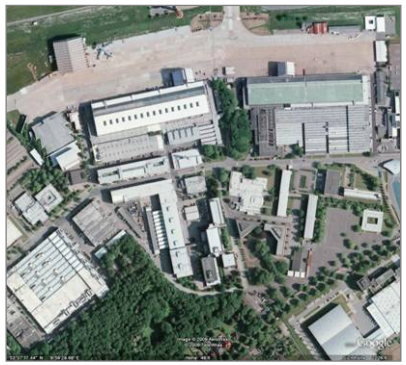
Our environmental responsibility

Key factors for the project kick-off

- The public measures the image and credibility of a company – and especially Lufthansa – by its efforts to reduce its emission of climate-relevant gases. Therefore LHT needs an integral long period energy strategy.
- Increasing demand for fossil fuels drives energy prices further and further up.
- In September 2007, Lufthansa Technik signed a voluntary letter of intent to reduce its CO_2 emissions by at least 30 percent until 2013 and launched a challenging carbon-eliminating program in coordination with Hamburg's industrial network.

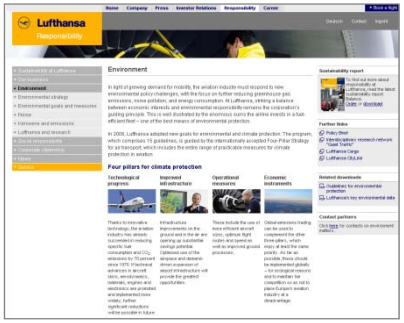




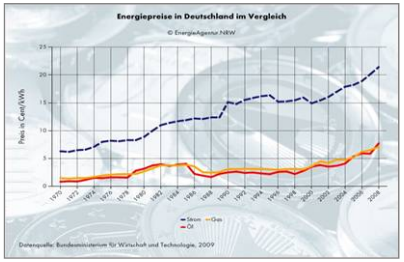
Our environmental responsibility

Project steps

- In the end of 2005 the Facility Management of Lufthansa Technik started a first Energy saving campaign.
- The project EnergyCheck@LHT was formed in January 2006.
- In October 2007, the Executive Board of Lufthansa Technik gave the green light for a comprehensive CO_2 reduction concept.
- Together with the consultants of ‘ennovatis’, Lufthansa Technik analyzed the energy consumption of all buildings and all major consumers at its Hamburg facility until July 2008.



Energie check @LHT



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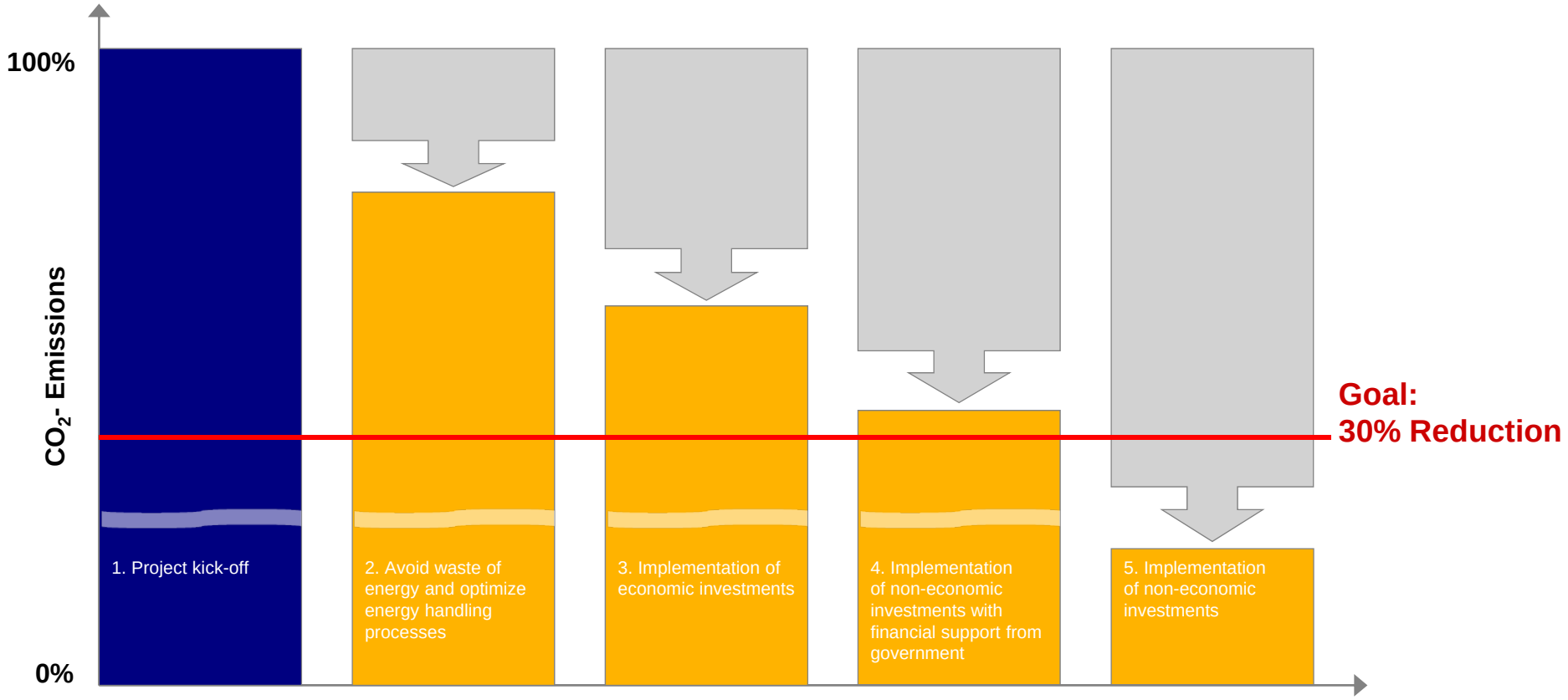
Selected Examples – CO_2- reduction project

Building Analysis

Energie check @LHT

Project Guideline



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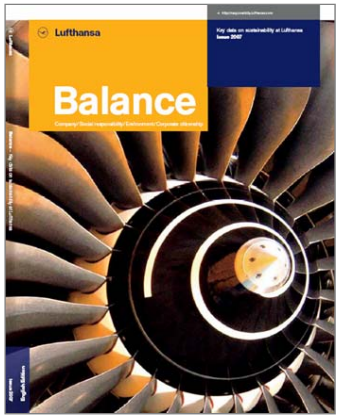
Project step 1

- Analyzing the complete potential of possible CO_2 reductions until February 2008 was the first task of the project team.
- All buildings and production processes were scanned to identify potential savings and check these for basic feasibility. Moreover, the team analyzed the usage of regenerative energies to achieve a significant contribution in reducing CO_2 emissions at our Hamburg facility.
- Close to 500 different topics with CO_2 reduction potential were discovered.
- Disregarding our economic boundaries a theoretical CO_2 reduction of about 70 % is possible.



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Actions for CO_2 reduction	CO_2 reduction potential per year	
Organization, optimizing production processes (e.g. implementation of energy management system, awareness improvement of employees)	ca. 20,000 t CO_2	27%
Structural implementations (e.g. energetic renovation of buildings)	ca. 14,240 t CO_2	19%
Infrastructural implementations (e.g. hydraulic optimization of our district-heating network, Thermal Power Station)	ca. 19,200 t CO_2	26%
Regenerative implementations (e.g. solar cells)	ca. 272 t CO_2	0,4%

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Project step 2

- All Items discovered in Phase 1 had to be evaluated by June 2008.
- After evaluation and consideration of our project guideline a CO_2 reduction potential of approx. 33 % can be implemented.
- The project team developed a package of measures to achieve our objectives by 2013, consisting of:
  - Top Ten measures (quick wins)
  - Long-term strategy for CO_2 and energy saving


Sustained Environmental Protection at Lufthansa Technik

Modern environmental management assumes progress

Internationally recognized certification

At Lufthansa Technik sustained environmental protection is a mission with special priority. As the market leader in the field of aircraft, engine and component maintenance, Lufthansa Technik has also played a pioneering role in the efficient utilization and conservation of resources. Since as early as 1996, Lufthansa Technik has operated a certified environmental management system in accordance with the Eco-Management and Audit Scheme (EMAS) as well as complying with the ISO 14001 international environmental standard.

Noise protection hangar, Hamburg

Don't scrap, repair!

Improving the service life of complex technical systems is just one of the items in a diverse range of missions at Lufthansa Technik. Efficiency and reliability are improved. As far as possible, parts due to be replaced are initially refurbished instead of being scrapped. By doing this, the company contributes proactively towards increasing material productivity and to the responsible management of (non-renewable) resources.

Advanced Recontouring Process – an innovative repair process

Responsible handling of resources, safe and efficient implementation of processes and the environmentally neutral disposal of waste are taken for granted at Lufthansa Technik along with conformance with legal requirements. Thus, over 70 percent of the waste generated at Lufthansa Technik during 2007 was sent for recycling.

Customer benefits in focus – developing innovative products

Customer benefits are the top priority. With this in mind, Lufthansa Technik leads the world with the innovative maintenance procedures that it develops. The aim is to significantly improve our customers' fuel efficiency through our maintenance products. A good example of this kind of innovative product development is the Cirdean™ engine cleaning system. Consistent application of this technology reduces the specific fuel consumption of an engine by over 0.5 percent, while at the same time extending its service life. Other innovative products include optimized overhaul procedures for engines and aerodynamic and weight-reducing measures.

Cirdean™ Engine Wash

Processes under control – challenges of the future

Lufthansa Technik intends to increase still further its contribution to the reduction of greenhouse gases by continued improvements in energy efficiency. At the same time we have been working continuously for many years on reducing the use of hazardous substances in overhaul processes – to the benefit of our staff and the environment.

Recycling of cabin windows

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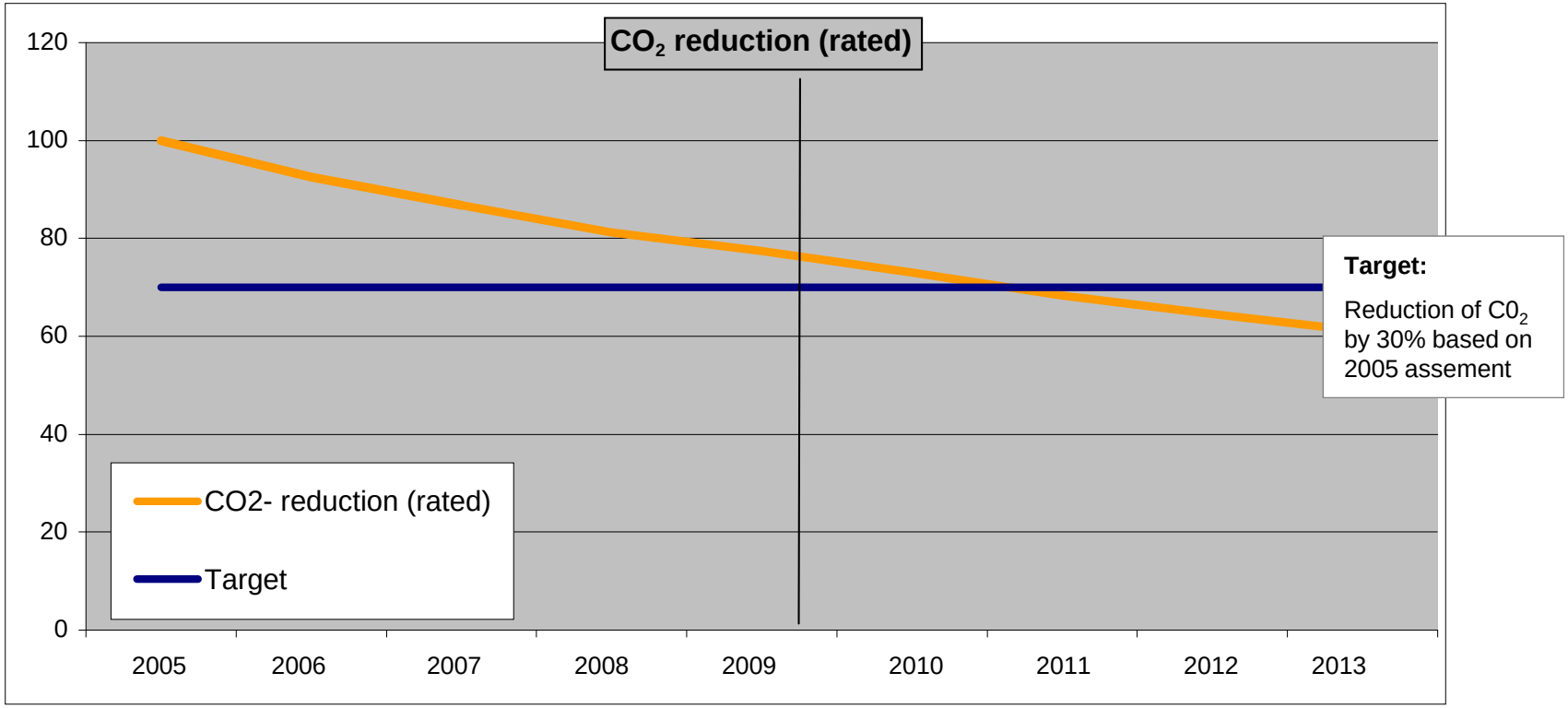
Current situation



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Selected examples – CO_2 reduction project

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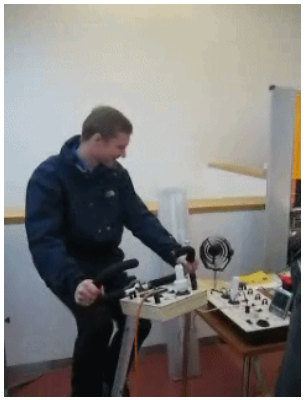
Create awareness within the company

- Build awareness on reducing energy demands in the company and at home
- Energy efficiency by balancing conservation and wastefulness
- Changing habits
- Motivation for an active participation

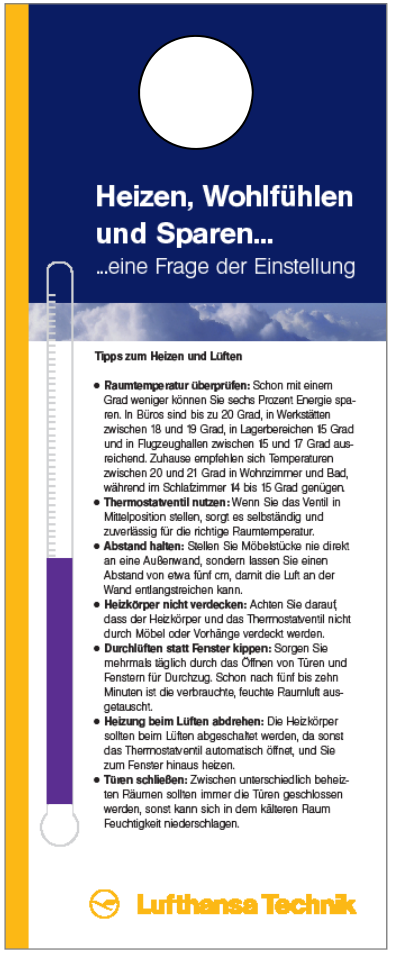


Selected Examples – CO_2- reduction project

On a regular basis, LHT Facility Management organizes ‘energy efficency’ campaigns

- Energy consumption of LHT in relation to a private household
- Innovative door tag ‘Save energy at work‘
- Raffles, e.g. offering energy-reduced bulbs
- Sales promotion for energy saving products

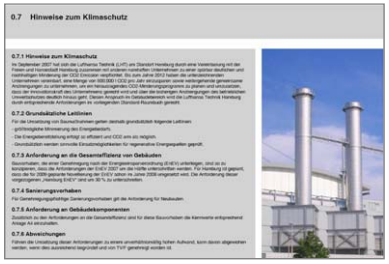
Innovative door tag
- …feel comfortable and … save energy
- Thermometer displays actual temperature
- Energy saving tips right at your desk



Selected examples – CO_2 reduction project

Implementation of standardized procedures and requirements for building and construction

- Standard room data sheets of approx. 150 pages:
  - General guideline and definition of qualities and technologies
  - Required handbook forms basis for external planners and internal partners
  - Complete design approaches and technical descriptions and requirements
- Standard business requirements documents:
  - General definition of space and process requirements for different industrial plants
  - Checklists and blueprints for project definition phase
  - Improvement of general planning quality and speed of project developing phase



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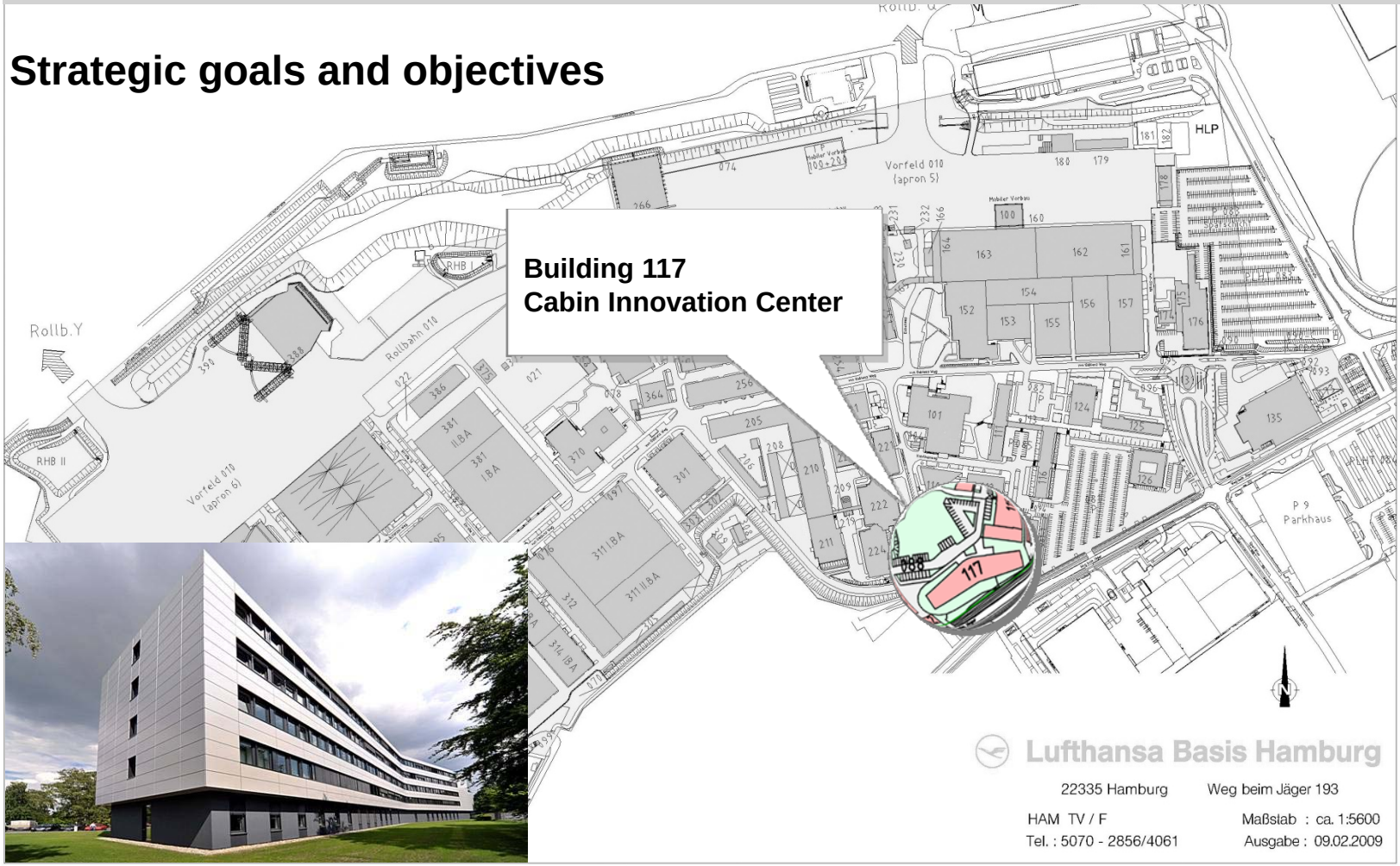
Building Analysis

Building Analysis Object No. 117

Strategic goals and objectives



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Building analysis ‘Cabin Innovation Center’

Fact sheet

- New research and development center for the Lufthansa Technik AG „Cabin Innovation“ business unit, investment of approx. 10 million € (14.7 million $)
- In addition to new offices, the center offers state-of-the-art test laboratories and exhibition areas for new product presentations
- Construction period of approx. 10 months, using a combination of modular and solid structures, among others with a facade featuring a thermal insulate composite system combined with an aluminum curtain wall system
- Five-story building provides a total gross area of 6,300 sqm (68,000 sq ft), split into a 2,300 sqm (25,000 sq ft) shop facility and 4,000 sqm (43,000 sq ft) office space

Building analysis ‘Cabin Innovation Center‘

Features

- Roof-collected water is ducted into a underground reservoir and is used for sanitary flushing
- Existing reservoir capacity of 54,000 liter (14,200 gallon) per unit
- Depending on the users‘ behaviour up to 700,000 liters (185,000 gallons) fresh water can be saved per annum

Building analysis Object No. 411

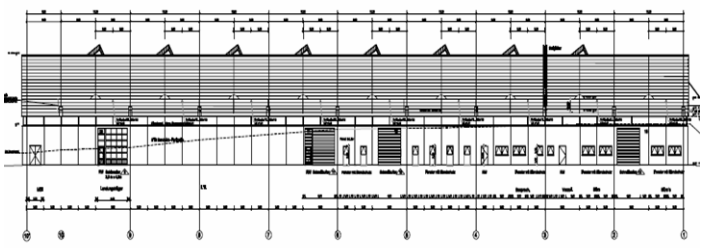
Strategic goals and objectives

Engine Overhaul Center
Building 411
Production facility

Building Analysis Object No. 411

Fact sheets

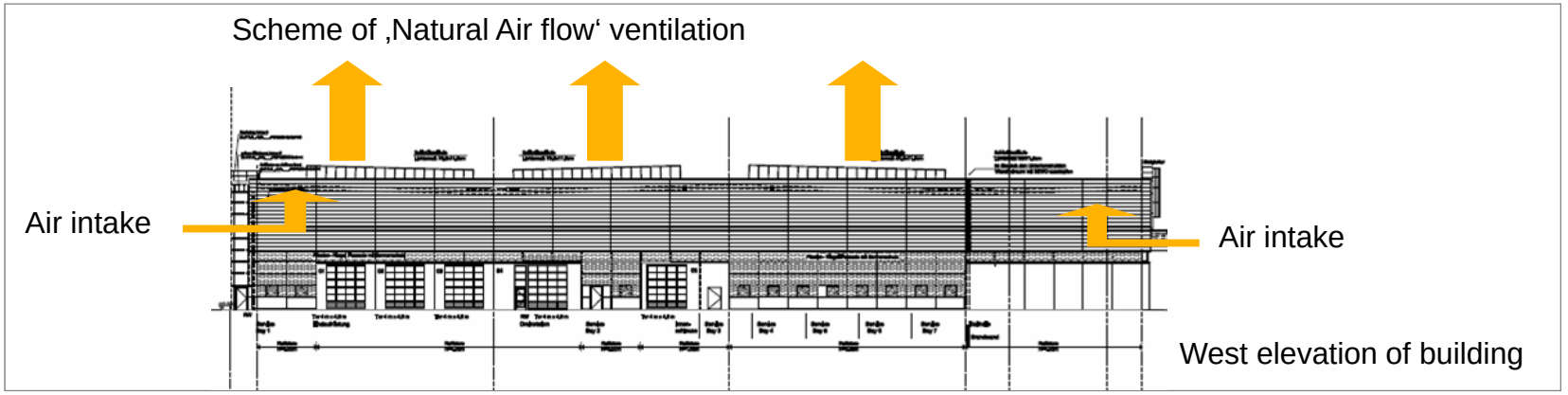
- Total gross area of main floor:
  approx. 15,000 sqm (160,000 sq ft)
- Entire roof area:
  15,000 sqm. with 10% roof openings
- Reinforced concrete construction with ceiling height of 11,40 m (38 ft)
- Building volume: 130,000 m³ (4.6 million cb ft)
- Total construction cost: 50 million € (55 million $)



Building Analysis Object No. 411

Measures taken

- Planning Phase: Reduction of window openings for single story complex
- Thermal building insulation above standard building requirements
- Implementation of significant roof openings allowing natural air flow to cover basic HVAC output



Thank you for your attention.