

ENERCON IN BRAZIL



ENERCON GmbH
Ruth Brand-Schock, Büro Berlin

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ENERCON FACTS



| | |
|--|---|
| Production area: | 435,000 m ² |
| Production facilities Germany: | Aurich, Emden, Magdeburg |
| Production facilities international: | Sweden, Brazil, India, Turkey, Portugal |
| Research and development departments: | more than 130 engineers |
| Sales offices national/international: | 8 national, 16 international |
| World service: | more than 160 stations |
| Logistics: | mobile cranes of up to 800 tons, hundreds of service vehicles as well as several special transporters for towers and blades |
| Installations worldwide: | approx. 12,900* wind energy converters |
| Installed capacity worldwide: | 14.6 Gigawatts* |

Stand: 05.2008

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WOBBEN WINDPOWER



WOBBEN WINDPOWER is a **Brazilian Manufacturer**, with German Capital of **ENERCON GmbH Group**, one of the biggest world-wide manufacturer of wind energy converters and other systems of clean and renewable energy.

WOBBEN WINDPOWER is the only Brazilian Manufacturer of wind energy converters from **800 to 2300 kW**.

WOBBEN WINDPOWER has **1200 direct employees** in **two manufacturing plants** in Sorocaba – Sao Pãolo and Pecém – Ceará.

WOBBEN WINDPOWER provides project, construction, assembly, operation and maintenance of windfarms



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ENERCON PRODUCTION FACILITIES



Rotor blade production
8 facilities worldwide



Generator production
5 facilities worldwide



Electronics
4 facilities worldwide



Tower production
5 facilities worldwide



Assembly
5 facilities worldwide

**Total production area
approx. 435.000 m²**

= approx. 47 SOCCER PITCHES

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PRODUCTION FACILITIES



Sweden (Malmö)

ENERCON Windtower Production A.B.
 • tower production

Germany (Aurich/Magdeburg/Emden)

• Headquarters
 • Research & development
 • Production

Portugal (Viana do Castelo)

• plants for towers, rotor-blades, generators, assembly, e-module
 • Assembly of E-82

Turkey (Istanbul)

ENERCON AERO Turkey
 • Rotor blade production

Brazil (Sao Paulo/Fortaleza)

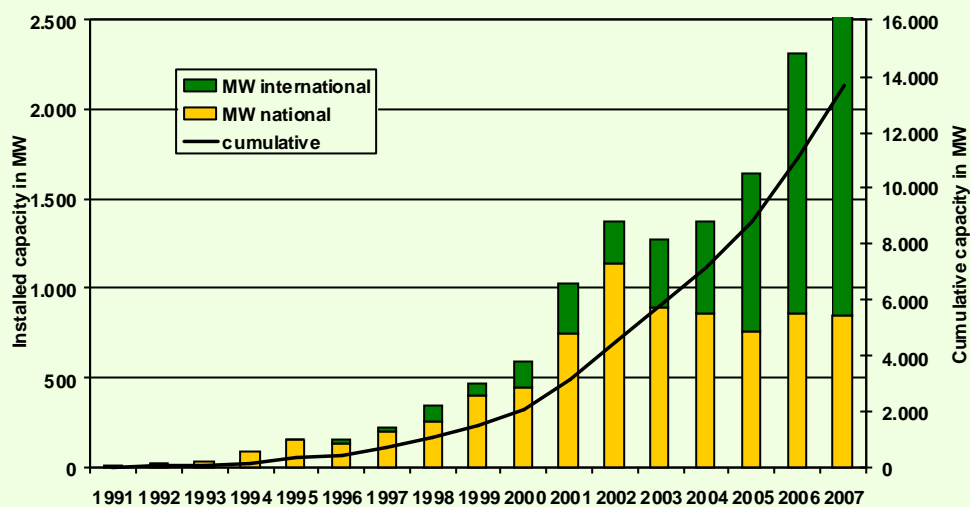
Wobben Windpower Ltd.
 • Production of E-48/E-70 components
 • Assembly of E-48/E-70

India (Daman)

ENERCON India Ltd.
 • Production of E-33/E-48

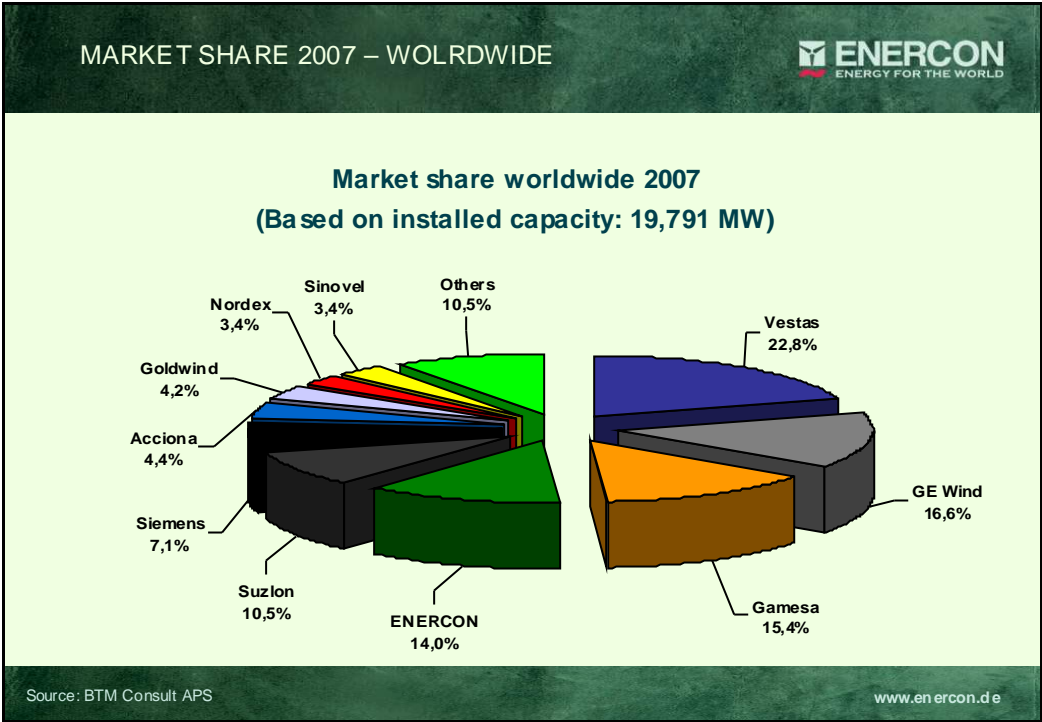
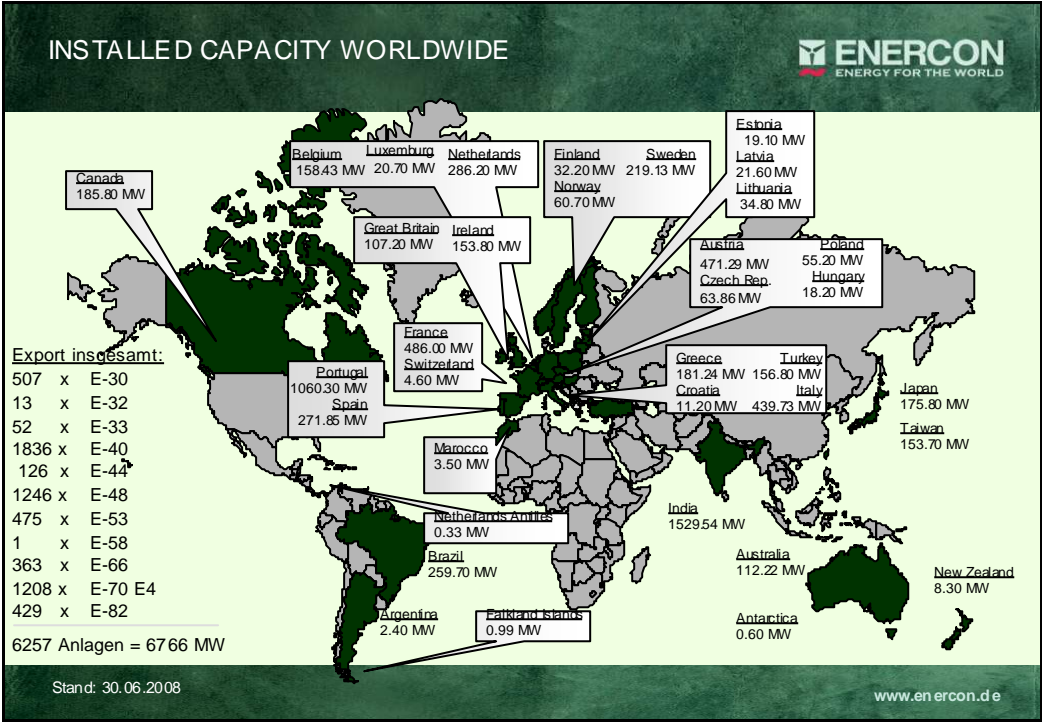
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ENERCON – INSTALLED CAPACITY



Source: 2008

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The gearless ENERCON concept is economically far superior to conventional turbine concepts.



Advantages:

- No Gear
- Low wear due to slow machine rotation
- Low machine stress due to high level of speed variability
- Yield-optimised control
- High level of grid compatibility



Wind energy converter Production
E-48 800 kW and E-70 2000 kW
Sorocaba - São Paulo State

Nationalization index above 60%



PRODUCTION FACILITIES: SOROCABA – SP



Wind energy converter Production
E-48 800 kW and E-70 2000 kW
Sorocaba - São Paulo State

Nationalization index above 60%



Blades Production
E-70 2000 kW



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PRODUCTION FACILITIES: PECÉM – CEARÁ



Wind energy converter Production
E-48 800 kW and E-70 2000 kW
Pecém - Ceará State

Nationalization index above 60%



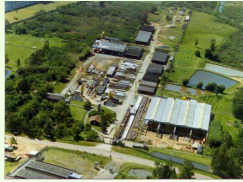
Blades Production
E-48 800 kW



Concrete Towers Production
75m of height for E-48 800 kW

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PRODUCTION FACILITIES: WOEBCKE



Wobbeke Factory
Contract to build concrete tower with supervision of ENERCON



Concrete Towers Production
98m of height for E-70 2000 kW

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ADVANTAGES



WOBHEN WINDPOWER, established in Brazil 12 years ago, also offers additional advantages Brazilian and Latin American wind market development such as:

- Purchase contract in Reais
 - Possibility of Financing in Reais considering a Brazilian Product
 - Only Brazilian employees, Germans only for teaching, training and support.
 - Brazilian Teams for Operation and Service
 - Wind energy converter of 800/900 to 2000/2300 kW, for all wind classes
 - Wind energy converter with total and proved compatibility with the utilities grid in the various states where it is interconnected
- **The product covers all Brazilian necessities, technical and environmental demands and requirements.**

Central Geradora Eólica Millennium, Paraíba State
13 x E-48/800 kW = 10,4 MW, 75m concrete tower
Owner: Pacific Hydro
Customer: Eletrobrás/SAELPA (energy supply)

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PROBLEMS AND SOLUTIONS



Osório Windfarm, Rio Grande do Sul State
75 x E-70/2000 kW = 150 MW, 98m concrete towers
Owner: Ventos do Sul/Enerfin/Elecnor
Customer: CEEE (energy supply)

Mentality

- German way of direct “instructions” could be interpreted as offensive.
- No critic in front of others (superiors or subordinates!)
- A certain “interest in private/family life” of colleagues is polite, not nosy. Regular direct contact (via telephone) is very important.

Language barrier

- English language abilities of personnel was critical on both sides and demanded a fair bit of time (misinterpretation/frustration).
- In the past years, this has improved, but still be aware of “room for interpretation” due to different mentality.

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PROBLEMS AND SOLUTIONS



Logistic and transport:

- Brazil is a BIG country. The infrastructure and the long distances are a permanent challenge.
- Road transport instead of coastal shipping. Analysis: where is the production – where is the market?
- Just a few big cranes available in Brazil, which means: high costs due to monopoly situation.



→ **Improvement of infrastructure:** state highways, shipping, equipment

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Tax

- federal tax, regional tax etc., varies in states.

Customs duty

- 20-55% import duty for different components, materials and raw material, but only 14% for entire turbines
- Now, the duty for finished wind energy converters is reduced to 0%, which is a competitive disadvantage for us, although we invested millions of Reais, produce in Brazil, employ hundreds of Brazilians, add technical knowledge etc.



Horizonte Windfarm, Santa Catarina State
 8 x E-40/600 kW = 4.8 MW
 Owner: CENAEEL
 Customer: CELESC (energy supply)

→ **Local content and long term investments should be valued more and be protected**



Macau Windfarm, Rio Grande do Norte State
 3 x E-40/600 kW = 1.8 MW
 Owner: PETROBRAS
 Customer: Self-Generation

Grid infrastructure

- The grid infrastructure is an integrated system, but still very different to the European system. It is extremely important to analyse very detailed every grid connection point (loads, grid code, lines available, etc).
- No “buy WEC – plug-in” possible!
- The Grid code changed and new technology is necessary. That causes higher investment costs.
- The developers prefer bigger wind farms for better balance of their plant. But for bigger wind farms, there are less suitable connection points available.

→ **Improvement of grid infrastructure in some areas and to offer technical solutions/flexibility**

POLITICAL FRAMEWORK AND PROINFA LAW



- WOBLEN WINDPOWER was established in the nineties in Brazil to cover the **domestic demand** for wind energy converters. But we would have had a hard time in the first years without having the possibility to export wind energy converters
- After a long time of negotiations, **PROINFA** (Programa de Incentivo às Fontes Alternativas de Energia Elétrica) started in 2003. Objective was to increase renewable energy production in the energy matrix with high local content demand.
- After **PROINFA Law** came into effect the domestic demand increased, but no other manufacturer seemed to want to take the risk of investment in this market. Why?
- All wind energy projects under **PROINFA Law** were realized by WWP! Other competitors were/are busy in other countries?
- The second PROINFA phase will probably not happen, but a **bidding-system** might be realized instead.
- Necessary evaluation: How much risk do you want to take? How much risk can you take?



Osório Windfarm, Rio Grande do Sul State
75 x E-70/2000 kW = 150 MW,
98m concrete towers
Owner: Ventos do Sul/Enferin/Elecnor
Customer: Eletrobrás/CEEE (energy supply)

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INSTALLED WINDFARMS IN SOUTH AMERICA



WOBLEN WINDPOWER

- build 13 Windfarms operating in Brazil, 6 of them und **PROINFA Law**, one in Operation in Argentina and 3 under construction
- installed 248 MW until 2007. 92 MW are under construction, more hundreds are in negotiations



The 340 MW Windfarms installed by WWP until december 2008 will reduce the emission of approx. **600.000 tons** of CO₂ per year.

Mucuripe Windfarm, Ceará State
4 x E-40/600 kW = 2.4 MW
Owner: WWP
Customer: COELCE (energy supply)

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INSTALLED WINDFARMS IN BRAZIL



Total of Windfarms installed and in construction by WOBBEN WINDPOWER until 2008

| | Installed Capacity | Wind Energy Converters | Number of Windfarms |
|--|--------------------|---|---------------------|
| Wind farms installed since 1998 until 2005 | 29,5 MW | 35 x E-40 / 500 kW 20 x E-40 / 600 kW | 8 |
| Wind farms installed in 2005 and 2006 PROWFA | 219 MW | 15 x E-40 / 600 kW 75 x E-48 / 800 kW 75 x E-70 / 2000 kW | 6 |
| Wind farms <u>to be installed</u> in 2007 and 2008 PROWFA | 91,6 MW | 92 x E-48 / 800 kW 20 x E-44 / 900 kW | 3 |
| | 340,1 MW | 332 WEC's | 17 Windfarms |

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Thank you very much for your attention

Água Doce Wind farm, Santa Catarina State
 15 x E-40/600 kW = 9 MW
 Owner: CENAEEL
 Customer: Eletrobrás/CELESC (energy supply)

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