**Universidade de Aveiro** Departamento de Economia, Gestão e Engenharia Industrial
**2008**

**RAQUEL MARGARIDO SIMÕES MORGADO**

# DA INOVAÇÃO PARA O MERCADO
# FROM INOVATION TO MARKET

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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Engenharia e Gestão Industrial, realizada sob a orientação científica do Dr. Henrique Manuel Morais Diz, Professor Doutor do Departamento de Economia, Gestão e Engenharia Industrial da Universidade de Aveiro

**o júri**

presidente

Professor Doutor Joaquim José Borges Gouveia
professor catedrático da Universidade de Aveiro

vogal – arguente principal: Prof. Doutor Luis Miguel Domingues Fernandes Ferreira, professor associado da Universidade de Aveiro

vogal – orientador: Professor Doutor Henrique Manuel Morais Diz
professor catedrático da Universidade de Aveiro

**agradecimentos**

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**palavras-chave**

Inovação, mercado, aquecimento de águas sanitárias, tendências

**resumo**

O âmbito do presente relatório consiste na apresentação da Bosch Termotecnologia SA; uma das sucursais do Grupo Bosch pertencente à divisão de Termotecnologia; e respectiva gama de produtos. Analisar as tencências em termos de disponibilidade de água e energia a nível Mundial e por continentes, assim como as tendências no aquecimento de águas sanitárias. Este projecto tem como objectivo final a definição de características chave na definição de um produto inovador na gama de aquecimento de águas sanitárias.

Mercados chave são definidos e divididos entre aplicações domésticas e aplicações comerciais de modo a definir a possibilidade de sucesso de introdução de um produto com as características inovadoras anteriormente definidas.

- ⇨ Análise dos produtos produzidos na Bosch Termotecnologia SA em Aveiro, Portugal
- ⇨ Inclui desenvolvimentos em poupança de energia e água
- ⇨ Procura the soluções de aqueciento de águas sanitárias
- ⇨ Inclui uma descrição dos mercados alvo: Aplicações domésticas e Aplicações comerciais (Cadeias de Hotéis, Caravanas, auto.caravanas, aviões comerciais e particulare, navios de cruzeiro e iates particulares e utilizações por ponto de uso)

O passo seguinte é encontrar uma estratégia para o lançamento do produto que esteja de acordo com a situação da empresa no mercado.

- ⇨ Descrever o mercado e as tendências do consumidor final para o mesmo
- ⇨ Identificar e agrupar os indicadores chave para um Mercado potencial referente a produtos inovadores
- ⇨ Analisar os competidores, as actividades e os produtos nos vários mercados potenciais
- ⇨ Apresentar os conceitos chave para produtos inovadores
- ⇨ Analisar um cenário de modelo de negócio para a introdução dum produto inovador

**keywords** Innovation, market, domestic water heater, trends

**abstract**

The scope of the present report is to present Bosch Termotecnologia SA (BT), a Bosch Group Company from TT Division and respective product Range. Energy and water demand worldwide and by region is included as well as demand in the hot water market. These analyses set a target to define the key characteristics for a innovation product in terms of hot water solutions.
Key target groups are defined and divided into domestic and commercial applications in order to define the feasibility of a business plan for the innovation product.

- ⇨ Analyze appliances produced in Portugal's plant
- ⇨ Include developments in energy and water demands
- ⇨ Demand for hot water solutions
- ⇨ Include key target groups: Domestic application, Commercial application (Hotel chains, Leisure vehicles, and Multi point of use)

The next step is to match a strategy for product launch with the company's situation.

- ⇨ Describe market and developments of targeted consumers
- ⇨ Identify and collect key indicators of market potential for innovation product
- ⇨ Scan competitors activities and products
- ⇨ Present concepts for innovation product
- ⇨ Analyse business model scenarios to introduce innovation product

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# INTRODUCTION

The present project report in being done in english since the project described was developed in Bosch Thermotechnology SA. The report is to be presented in Bosch which is a international company and its official language is the English.
All the B letters subscripted in the titles mean that that part of the analyses was done by other members of the Market Research team. These parts are included in the report due to it's significance in the overall conclusions.
The purpose of the project is to develop a innovative product according market trends and develop a market introduction strategy for such proposal.
Nowadays the Macroeconomic trends are being developed to reach environmental friendly products in terms of water and energy savings. These characteristics are main features to consider in the development of a product.
In the domestic water heating we were able to define the innovation product ideal in this type of market, study the several market opportunities to such product and develop a strategy proposal to enter the product in this market.

# INTRODUCING BOSCH GROUP

Robert Bosch founded the "Workshop for Precision Mechanics and Electrical Engineering" in 1886 in Stuttgart, this was the beginning of one of the best-known German industrial enterprises - the BOSCH Group, which is now active throughout the world. In 1898 BOSCH opened it's first sales office outside Germany in the United Kingdom. In 1913, before the First World War, BOSCH generated 90% of its sales outside Germany.

Over the past ten years, the company has been able to more than double its sales, and to further expand its international presence. In 2007, sales rose by nearly six percent to 46.1 billion euros. Associate numbers have also risen once more: at the end of 2007, some 272,000 associates were employed at Bosch. This is 11,000 more than last year. In Germany, the number of jobs increased by more than 1,800 to 112,000 in total.

## *Bosch Sectors*

Bosch position in diverse areas of activity has proved to be an advantage for the overall development of the company. Nowadays, Bosch is a globally supplier of automotive and industrial technology, consumer goods, and building technology in the **Automotive Technology sector**, **Industrial Technology sector** and **Consumer Goods and Building Technology sector**.
To maintain its technological lead, Bosch once again increased its research and development spending in 2007, to 3.6 billion euros.

## *The Thermotechnology Division*

Bosch Thermotechnik GMbH is the heating division of the Bosch Group. Consolidated sales were up to 2.8 million EUR in 2006. The Thermotechnik division consists of 20 plants in 9 countries, where we developed and produce heating technology solutions and hot water equipment for sale in some 50 countries worldwide. Product solutions for this division try to make an active contribution to energy efficiency and the reduction of $CO_2$ emissions from private homes. One of the way to accomplish this goal is to combine condensing and solar technology whish has savings of $CO_2$ compared with 30-year-old heating systems can reach the 60 percent.
Bosch Thermotechnik GMbH owes its market position to the strength of several international and regional brands, which represents one of the company's assets. No matter whether it is an international or a regional brand, each one stands for Bosch Group "Principles of Business Excellence" – quality, innovation and customer satisfaction.
Bosch Thermotechnik GMbH commercialized brands:

BOSCH

Main Brand

Buderus

Known for supplying floor standing cast iron boilers, condensing technology and heating technology. Acquired by Bosch Group in 2003.

JUNKERS

Brand for wall hung gas-fired boilers and hot water solutions in Europe. Acquired by Bosch Group in 1932.

DAKON

Czech brand for heating technology. Acquired by Bosch Group in 2003.

e.l.m. leblanc

French brand for gas-fired heating boilers and gas-fired water heaters. Acquired by Bosch Group in 1996.

IVT

Swedish brand for electric heat pumps. Acquired by Bosch Group in 2004

GEMINOX

French brand for steel heating boilers and European brand for condensing boilers. Acquired by Bosch Group in 1996.

Vulcano

Portuguese brand for water heaters. Acquired by Bosch Group in 1988.

AHP

American manufacturer of electric water-source heat pumps for the heating and air-conditioning of residential buildings and commercial premises. Acquired by Bosch Group in 2007.

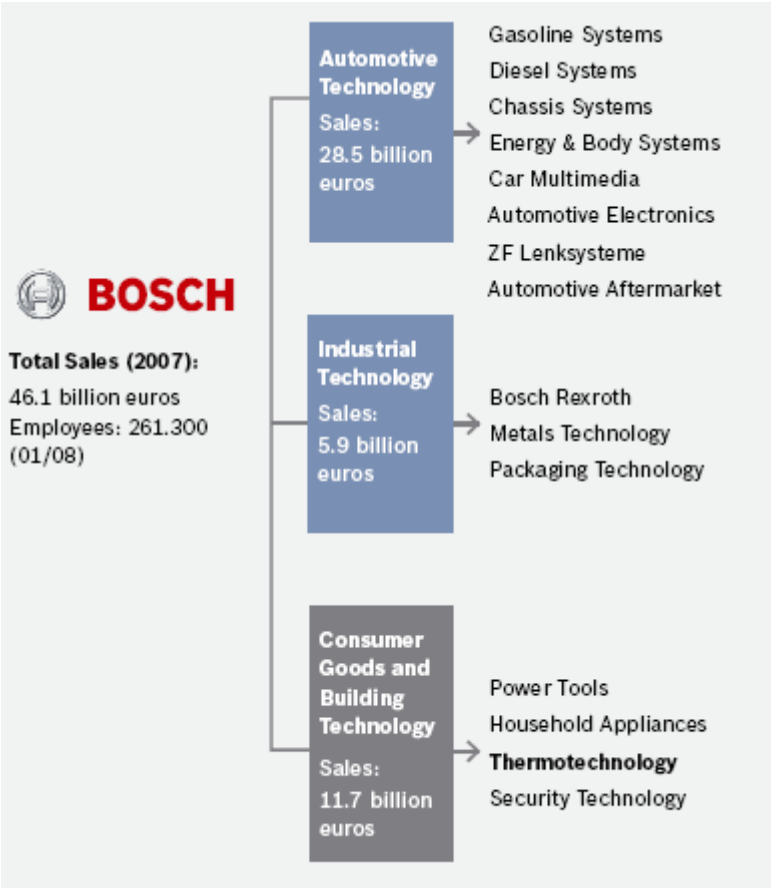
German brand for heating systems and solar power systems. Acquired by Bosch Group in 2003.

UK brand for gas and oil-fired boilers. Acquired by Bosch Group in 1992.

Dutch brand for condensing boilers. Acquired by Bosch Group in 2003.

## BOSCH TERMOTECNOLOGIA SA

Bosch Termotecnologia SA (former Vulcano – Aveiro) is a part of Consumer Goods and Building Technology sector from Bosch Group, more precisely a part of the Thermotchnology (TT) Division of Bosch Group.




Picture 1 Thermotecnology division within the Bosch Group [(1)]

### *History*

1997 - Vulcano started its activity in Cacia, Aveiro, on March 17th of 1977. In the beginning started producing and sale water heaters based on a contract with Robert Bosch in order to transfer technology used by the German company in the production of theirs water heaters.

1983 - The company introduced Vulcano brand on the portuguese market.

1985 - After 2 years Vulcano leads Portuguese market of water heaters.

1988 – Vulcano obtains certification by the Quality System. Bosch Group acquires Vulcano transferring tools, machinery and competence centre initializing the

specialization inside the Group, being a part of Bosch's Thermotechnology division.

1993 – The Research & Development Centre is created in order to introduce innovation in water heaters market. Several innovations were introduced which backed up the strategy of investing in a R&D Centre.

1994 – Vulcano introduced the first intelligent water heater with battery ignition.

1995 – Taking advantage of development synergies in gas burner appliances, Vulcano starts producing boilers.

2000 – The smallest hydrogenerator was created by Vulcano which won a patent due to worldwide innovation. This technology launched click HDG water heater.

2001 – A compact range of water heater is launched in the market.

2002 – Bosch Group turns Vulcano into worldwide Competence Centre for water heaters.

2003 – Launch of water heaters: one with remote control and other with high capacity (24l/min), the last one was only launched in America. This year **Vulcano obtained the Quality Certification updated for ISO 9001:2000** and the **Environmental Certification according ISO 14001 norm**.

2004 – The compact size is applied in boilers with the launch of Babystar. Vulcano **obtains APCER Certification according Quality Management system and ISO 9001:2000 international norm**. Strict criteria were defined for Technical Support in terms of service quality and Certificated Support concept was implemented. Beginning of Implementation of Bosch Production System (BPS) in Vulcano plant.

2005 – Launch of new design for compact range. Vulcano enters a new business area: Solar Energy. The new Greenstar boiler has condensing technology, which reduces CO2 and NOx emissions. **Obtained EMAS Registration** (Ecomanagement and Audit Communitarian System).
3,6 million euros are invested in R&D

2006 – Click HDG and CLIck are awarded with Industrial Design International Award "iF". The second generation of Fan Assisted water heaters is launched, now in compact size. Lifestar boiler with 28-30kW of power and a LCD display is introduced in the market.

2007 – In the 1st of February Vulcano's designation changes to BBT Termotecnologia Portugal SA to be in line with Bosch Group. A new range of solar solutions is launched.

2008 – In the 1st of January BBT Termotecnologia Portugal SA changed the designation to Bosch Termotecnologia SA, being identified as part of Bosch Group.

## *Economic Data*

Average sales in the last 3 years: 170 million euros
Number of employees: 1000
Worldwide sales: 54 countries

## TT/SWH - Product Management

Bosch Termotecnologia SA is considered the worldwide Center of Competence for Water Heating. The present project was developed within the SWH (Sales Water Heaters) Department which is responsible for the international Product Management - Gas and Electric Water Heaters and since 2005 Solar Panels. We are located in Aveiro (Portugal) in the heart of the TTPO organization which is the worldwide Center of Competence for Water Heating. The tasks developed in TT/SWH include:
Analyze and understand customer and end user needs and requirements around the world;
Identify new business opportunities and define new product concepts and product ranges (programme, planning and innovation).
Represent our customers and users in the new product development teams, all along the Bosch Termotecnologia TTM (Time To Market) process and contribute to timely, quality and profitable introduction of new products.
Manage existing range of Gas, Electric and Solar compatible Water Heaters as well as Solar Systems (sales, results, market shares, life cycle management).

TT/SWH vision: "…Worldwide leading position in water heating through innovation and profitability…".
TT/SWH mission: Customer Satisfaction.

Range of products managed in TT/SWH:

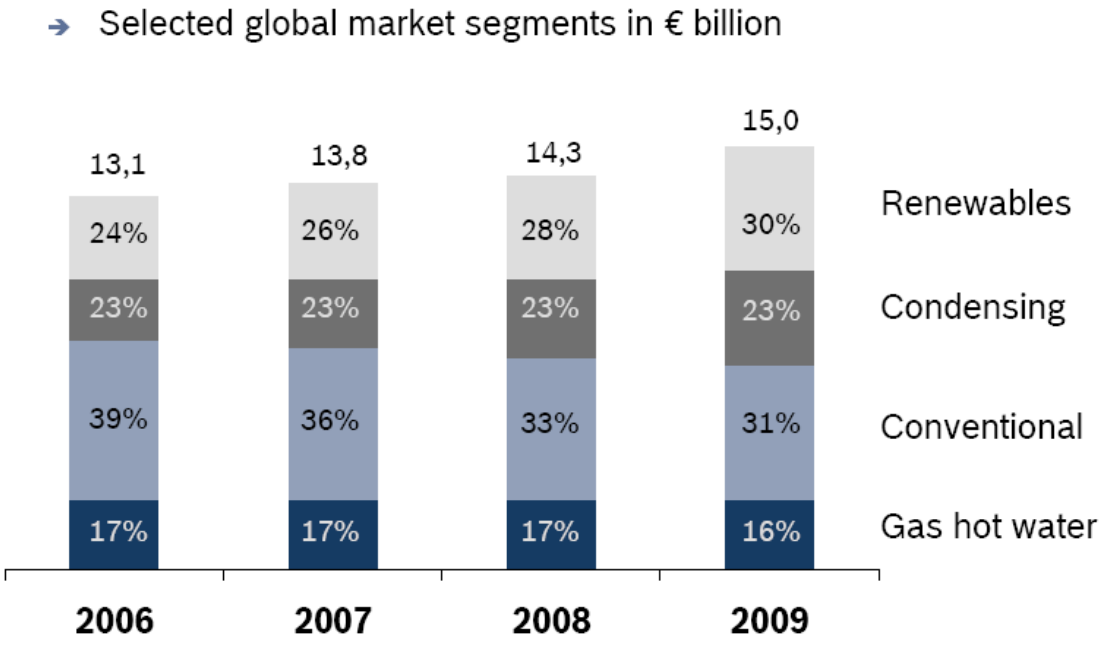
Gas Water Heaters:
Basic Range: AS0 (appliances produced with Chinese technology); 5L appliances (low capacity)
Comfort Range: Classic (above of 5L appliances), Compact1, Compact2 and Celsius appliances
High Output Range:; World1 and world2
Solar Kit (Set of valves that can be connected to any Gas water Heater or Boiler in order to work integrated in a solar system)

Electric Water Heaters:
Electric Storage Tanks;
Electric Instantaneous water heaters

Solar Range:
Solar systems including:
Solar Collectors;
Thermosyphon;

## THERMOTECHNOLOGY MARKET – Trends

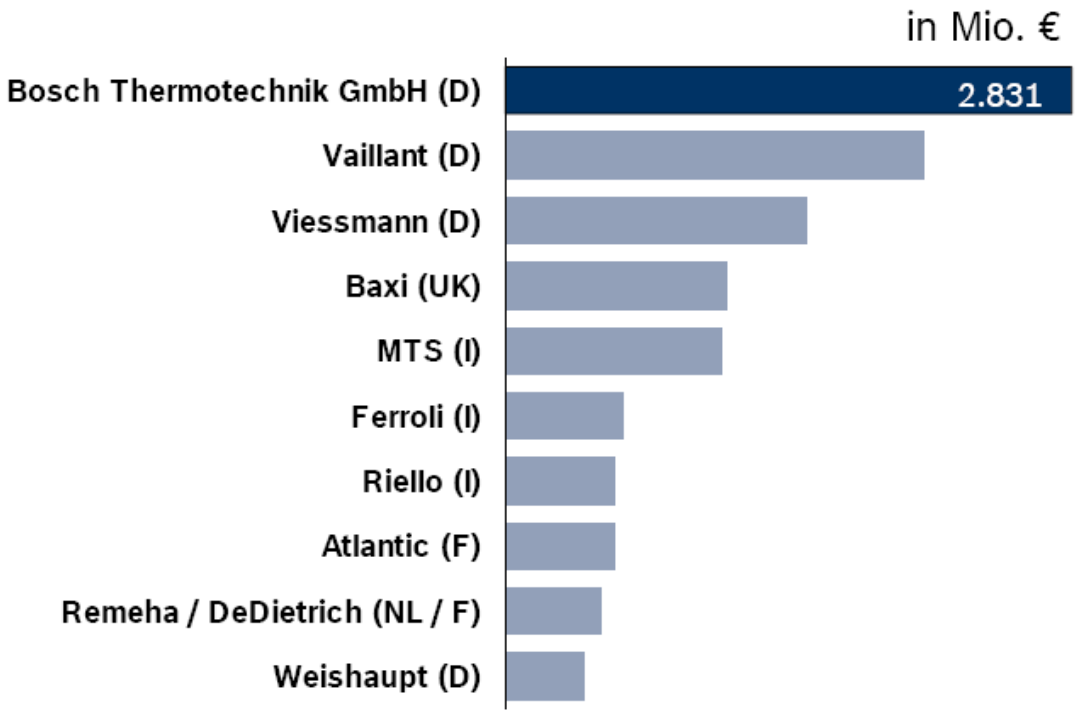
The global thermotechnology market is very heterogeneous. Nearly all regions differ with regard to consumption behaviour, market structures and competition. The markets are influenced not only by regional climates and building styles, but also by the existing infrastructure, energy supplies as well as by local regulations and standards.
The thermotechnology market is characterized by a large number of market participants, both at manufacturer and wholesaler level.
The customer base of manufacturers and wholesalers of heating and hot water solutions is equally large and diversified, comprising installers and specialist heating engineers, planners, builders and architects as well as a small number of consumers. A new costumer group – specialist companies for systems using renewable energy sources – has entered the market in recent years. Their importance has increased steady in line with the growing technological complexity and the more widespread use of renewable energies in the heating technology sector.




Picture 2 Global market – renewable lead the way [2]

Competition in the thermotechnology sector continued to increase in the past year. The growing technological standards of the systems, combined with strong pressure on prices led to continued market consolidation with numerous cooperations and acquisitions, especially in the western European heating technology market.

Due to strong worldwide presence, broad product portfolio (oil and gas heating systems both condensing and conventional, storage systems, gas water heaters, electric instantaneous water heaters, solar collectors, electric heat pumps and solid fuel boilers), access to different distribution channels, financial strength support growth and ability to innovate, Bosch Thermotechnik division still the top selling manufacturer within the thermotechnology market.




Picture 3 Number 1 in heating products – Europe 2006 [(2)]

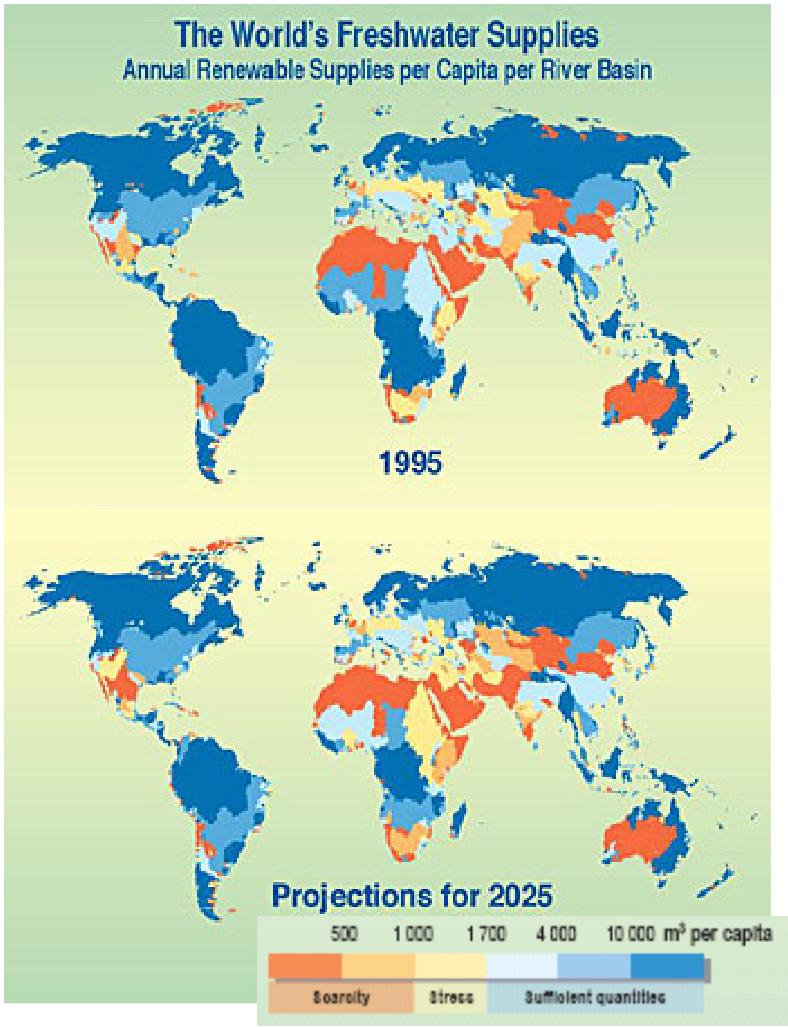
Nowadays this market offers attractive opportunities. Higher energy prices, the problem of reliable energy suppliers and greatly increased concern about the consequences of climate change mark a turnaround in public and political awareness. Governments and supranational institutions are likely to demand and promote the use of energy-efficient technologies also in the building sector going forward. At the same time, consumers throughout the world are attaching importance to individual comfort and a pleasantly heated home. The trends towards the “intelligent home” with a networked, remote controlled household will also continue and make new demands on future technological solutions.

## MACROECONOMIC OVERVIEW – TRENDS AND POLICIES

### *Worldwide Trends*

In the Thermotechnology Market, water plays a major role as the raw material in the sanitary water connections in every household, hotel, store or industry. To heat up the water energy consumption is a major player in terms of energy supply.
Nowadays water supply and energy saving are the drivers on subjects like climate change and environment protection.

Between 1990 and 1995 world population doubled and water withdrawals increased three times. According to PAGE (Pilot Analysis of Global Ecosystems) by 2025, assuming current consumption more than 3.5 billion of people or 48% of world's population will be facing water scarcity.
Estimates of global water resources based on several different calculation methods have produced varied estimates. Shiklomanov in Gleick (1993) estimated that:
-the total volume of water on Earth is ~1.4 billion $km^3$;
-the volume of freshwater resources is ~35 million $km^3$, or about 2.5% of the total volume;
-of these freshwater resources, ~24 million $km^3$ or 68.9% is in the form of ice and permanent snow cover in mountainous regions, the Antarctic and Arctic regions;
-8 million $km^3$ or 30.8% is stored underground in the form of groundwater (shallow and deep groundwater basins up to 2,000 metres, soil moisture, swamp water and permafrost). This constitutes about 97% of all the freshwater that is potentially available for human use;
-freshwater lakes and rivers contain an estimated 105,000 $km^3$ or ~0.3% of the world's freshwater;
-the total usable freshwater supply for ecosystems and humans is ~200,000 $km^3$ of water, which is < 1% of all freshwater resources, and only 0.01% of all the water on Earth (Gleick, 1993; Shiklomanov, 1999).
The uneven distribution of freshwater creates major problems of access and availability. The climate change will increase water withdrawals and decrease water availability. . It is estimated that water pollution/contamination denies close to 1.3 billion people (~ 20% of the global population in 2000) access to clean water supplies.

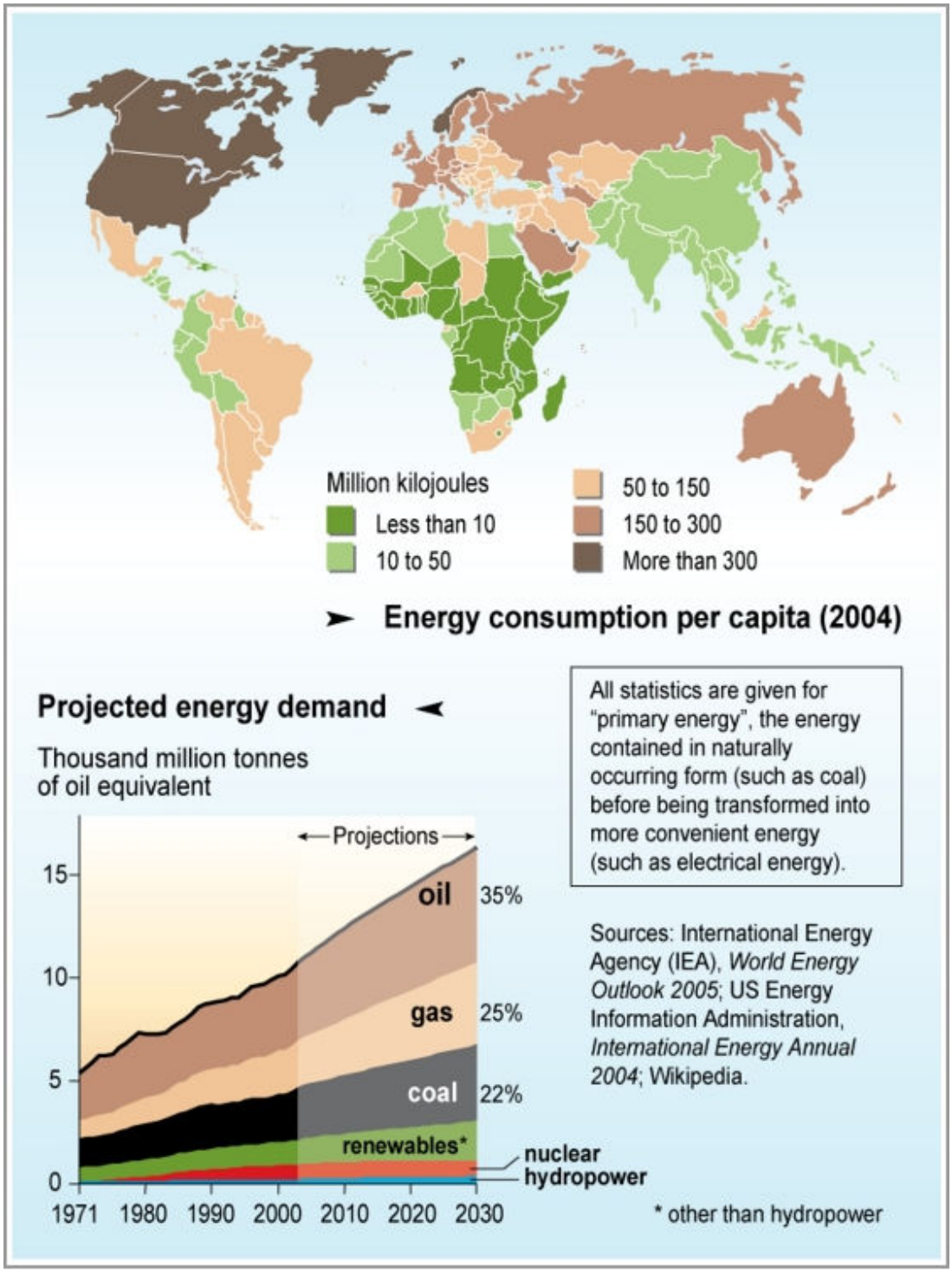



Map 1 Freshwater Projections for 2025 keeping actual consumption levels [3]

In 2025 the most affected regions with water scarcity will be: Australia, Middle East, East US (mainly California and Texas) and North and South Africa.

In the last 35 years worldwide energy consumption doubled, and 40% of this consumption it's on buildings.
According to the "World Energy Council 2007" the energy demand of all households worldwide must double by 2050. Agreements were done in WEC in order to set a value for carbon. 16,000 billion dollars will be needed to satisfy the world energy demand in 2030.
Initially, around 2020 primary energy will supply the increasing of energy demand, but in a long term the efficient solution is to find more energy efficient technologies. Oil and natural gas will account for more than 60 per cent of the increase. During the same time period renewable energy growth is lower.
Fossil fuels will continue to account for the largest proportion of primary energy, requirements to be address in order to be able to supply the increasing amount of energy:
-improve access effectively;
-effective manage gas emissions;
-address climate changes;

-develop new technologies.
In order to achieve a sustainable energy future energy should be sourced out from alternative energy suppliers such as hydroelectricity, nuclear power with planning of the spent fuel needed, biofuels, biomass and all other renewable energies.




Map 2 Energy consumption per capita in 2004, and projected energy demand until 2030 [4]

## *Worldwide Policies*

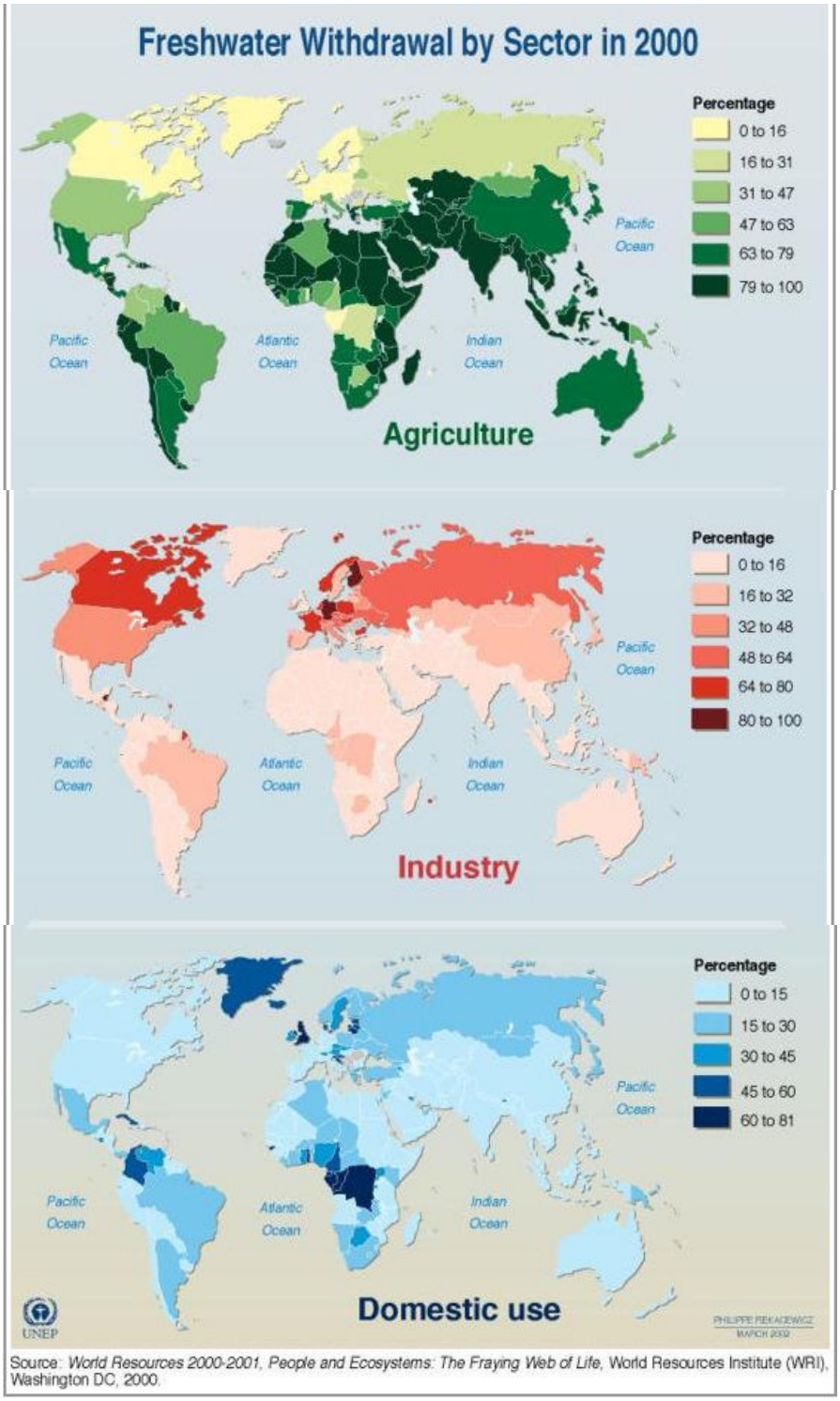
Regarding water and energy scarcity measures were taken worldwide in order to prevent and downsize the consequences of these problems.

Main measures to prevent water scarceness:
-prevent droughts;
-support efficient water allocation and sustainable land use planning: reduce uneven distribution of water;
-foster water performance technologies and practices: create public awareness of water saving products;
-foster the emergence of a water-saving culture in Europe;
-look for new ways of water supply.

Main measures to prevent energy scarceness
-promoting energy efficiency: using available methods from exploration to final energy use;
-raising public awareness: of how the transport sector can play an important role in more efficient energy use;
-setting a global price for carbon: high enough to drive prices and motivate behaviour changes, and low enough not to hamper (hold back) strong economic growth;
-creating a new international framework for technology transfer: countries develop technologies meeting their energy priorities and develop local skills;
-global dialogue on security of supply and demand: new international models of cooperation that provide for long term security on both sides are in order;
-taxation, legal and commercial frameworks: that limit investment risk and fostering realistic expectations for risk and return.

## MACROECONOMIC VS SANITARY WATER HEATING

Bosch Termotecnologia SA is expert in sanitary water heating (swh), what we need to evaluate are the parameters in terms of domestic water and energy policies for swh.




Map 3 Freshwater withdrawal for agriculture, industry and domestic use [5]

The agricultural sector is by far the biggest user of freshwater:
In the United States, agriculture accounts for some 49% of the total freshwater use, with 80% of this volume being used for irrigation (Shiklomanov, 1999).
In Africa and Asia, an estimated 85-90% of all the freshwater used is for agriculture (Shiklomanov, 1999).
According to estimates for the year 2000, agriculture accounted for 67% of the world's total freshwater withdrawal, and 86% of its consumption (UNESCO, 2000).
By 2025, agriculture is expected to increase its water requirements by 1.2 times, industry by 1.5 times, and domestic consumption by 1.8 times (Shiklomanov, 1999).
The world's irrigation areas totalled approximately 253 million hectares in 1995. By 2010, they are expected to reach about 290 million hectares, and by 2025 about 330 million hectares (Shiklomanov, 1999).
By the year 2000, an estimated 15% of the world's cultivated lands were irrigated for food crops, accounting for almost half of the value of global crop production (UNESCO, 1999).
In the industrial sector, the biggest share of freshwater is stored in reservoirs and dams for electrical power generation and irrigation. However, the volume of water evaporated from reservoirs is estimated to exceed the combined freshwater needs of industry and domestic consumption. This greatly contributes to water losses around the world, especially in the hot tropical regions (UNESCO, 1999).
Industrial uses account for about 20% of global freshwater withdrawals. Of this, 57-69% is used for hydropower and nuclear power generation, 30-40% for industrial processes, and 0.5-3% for thermal power generation (Shiklomanov, 1999).
Domestic water use is related to the quantity of water available to populations in cities and towns.
People in developed countries on average consume about 10 times more water daily than those in developing countries. It is estimated that the average person in developed countries uses 500-800 litres per day (300 $m^3$ per year), compared to 60-150 litres per day (20 $m^3$ per year) in developing countries (UNESCO, 2000).
In large cities with a centralised water supply and an efficient canalisation system, domestic consumption does not usually represent more than 5-10% of the total water withdrawal (intake) (UNESCO, 2000).
Water withdrawal in large cities is estimated at 300-600 litres per person per day, while small cities have a water withdrawal of ~100-150 litres, and consumption can reach 40-60% of the total water intake (UNESCO, 2000).
In developing countries in Asia, Africa and Latin America, public water withdrawal represents just 50-100 litres per person per day. In regions with insufficient water resources, this figure may be as low as 20-60 litres per day (UNESCO, 2000).
Managing water resources using an integrated river basin management approach is the most sustainable way of ensuring ecosystem integrity. In this respect, there is a need to consider the economic value of freshwater ecosystems, including their fisheries, wildlife habitats, recreation and natural flood control benefits. [(5)]
In several countries the scarcity of water and the usage of energy in years to come will present very high values. Especially in developed countries were survival is not the main issue to be addressed; countries are developing special labels in

order to demonstrate to the end user the efficiency of a specific appliance in terms of water and energy consumption.

We will analyse first the water and energy trends and policies and after the labelling (one of the regulations used) in European Union, United States of America and Australia since they are countries facing water scarcity in some regions and will be main energy users in the future. These labels have the purpose of informing the end user about the environmental features of the product they are buying.

## *European Union*

In 2030 northern Europe will increase on annual water run-off and average precipitation will raise. Average river basins run-off in Southern Europe will decrease as precipitation levels also decrease. Some river basins in the Mediterranean region (often face water scarcity already) are expected to decrease 10% until 2030.

Your guide
to greener products

Ecolabel: “Information (usually displayed on a product label) which makes customers aware of the environmental characteristics of an article or the production or processing methods used to produce it. Official labels undergo independent checks.”

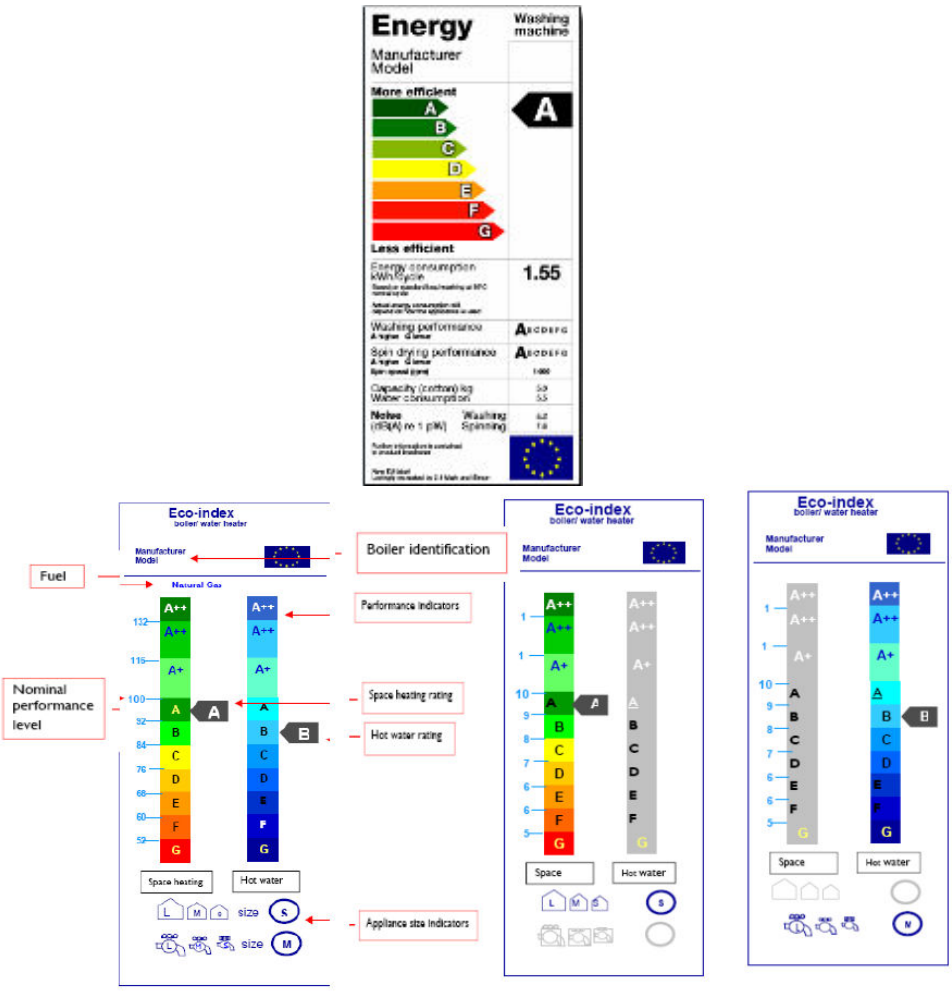
In Societ Generale; Sustainable developpement glossary

Established in 1992, the EU Eco-label “Flower” is a unique certification scheme aimed to help European consumers distinguish greener, more environmental friendly, products and services (not including food or medicine).
The main regulations for water saving devices in households study in ecolabel state that:
-regarding to water saving showering is much more efficient than baths;
-with technological improvements regarding the performance of household devices, savings can reach 25%;
-the use of atomising or aerating showerheads present some limitations for domestic use, such as:

- ‘Cold feet’ effect as the droplets cool quickly
- Noisy showers
- Moisture problems due to increased droplet surface and hotter water

Introduction of a product that improves efficiency and limits excess flow without impairing performance are not commercially available at the present.

Comparing the existing solutions with water efficient solutions we would have a reduction on water use in showers around 33%-44%; in taps we would have reductions around 15%.
Europe is nowadays concern with Acceptability in terms of energy supply, of International treaties and protocols. From 2005 until 2020 Europe target is to reduce emissions, stabilize them by 2035 and start to appeal to other types of energy suppliers as nuclear, renewable that comes in the forms of biomass, solar and wind.
In terms of energy labelling the traditional label just gave a information regarding power of the appliance. With the eco-label scheme what EU is trying to evaluate is not only the energy supply needed for the appliance but, if the appliance spends water, what is the level of efficiency on that characteristic.
Energy use by heating systems and water heating systems accounts for a significant part of total Community household energy demand. The scope for reduced energy use and the environmental impact including greenhouse gas emissions by the equipment used in these appliances is substantial.




Picture 4 Old energy efficiency class label vs new water/energy efficiency label [6]

## *United States of America*

During 2000, about 85% of the population in the United States obtained drinking water from public suppliers, compared to 62% during 1950. California, Texas, New York, Florida, and Illinois accounted for 40% of total public-supply withdrawals and 38% of the total population served by public suppliers. Changes in production, technology, and economic conditions have affected industrial water use. Periodic droughts have drawn attention to limits in the reliability of local and regional water supplies and influenced short-term water use for all users.

WaterSense is a partnership program sponsored by the U.S. Environmental Protection Agency. Its mission is to protect the future of our nation's water supply by promoting and enhancing the market for water-efficient products and services. Nowadays saving water can be done. Many products are already available for use, these don't require changing the way most of us live or do business. Products labeled through the WaterSense program, stand for water saving features.

Indoor water use accounts for approximately one half to two thirds of all residential water use. Showering is one of the leading uses of water, representing approximately 17% of residential indoor water use, or more than $4{,}5 \times 10^{12}$ lt (1.2 trillion gallons) of water consumed in the United States each year.

Residential lavatory and kitchen faucets account for approximately 15.7% of indoor residential water use in the United States - equivalent to more than $4{,}2 \times 10^{12}$lt (1.1 trillion gallons) of water used each year.

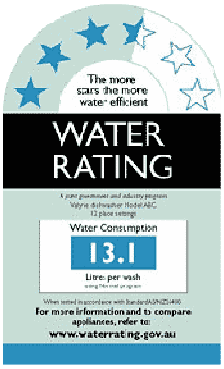
Comparing the existing water efficient solutions the reduction of water use in showers would be around 20%-40%; in taps we would have reductions of 32% minimum.

The energy demand will grow 30% by 2030 and can reach 50% by 2050. Increasing reliance on coal and associated facilities for producing hydrocarbon derivates (gaseous and liquid fuels). 80% of people live in urban areas which creates a opportunity to make cities more energy efficient. Change fossil fuels for renewable sources and develop more fuel-efficient vehicles, plug-in hybrids and hydrogen-powered vehicles. Enhance energy efficient technologies and accelerate its introduction. Need for national fiscal reform to accelerate oil and gas supply. North America Free Trade Agreement (NAFTA) has to remove trade barriers in order to increase trade in energy commodities and interlink of the energy systems.

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy to help consumers choose a energy efficient product or practices through money saving and environment protecting features.

## *Australia*

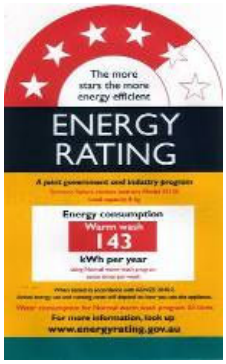
Although Australia's average annual rainfall of 469 mm/year is not particularly low, only 12% of it runs off to collect in rivers. Australia has 447 large dams storing about 79,000 GL (gigalitres) of water for mainly urban, irrigation and hydro-electric power users, and to provide flood mitigation. Australia also has several million farm-dams estimated to store 9% of the total water stored (Institution of Engineers, Australia). Australia has 25,780 GL (gigalitres) of groundwater suitable for potable, stock and domestic use, and irrigated agriculture that can be extracted sustainably each year of which 2,489 GL (gigalitres) are used. 168 of Australia's 538 groundwater management units are close to or over-allocated, and 161 are over-used. Three of the groundwater management units across Australia have formal environmental allocations. 84 of Australia's 325 surface water basins are currently close due to over-used in terms of meeting sustainable flow regimes. Currently 31 of Australia's 325 basins, have formal allocations for the environment. The benefits of these allocations to the environment will be assessed over time as the State and Territory water management agencies progressive implement the National Water Reform Framework.




Water Efficiency Labelling and Standards (WELS) Scheme: WELS is Australia's new water efficiency labelling scheme, which allows consumers to compare the water efficiency of different products. By buying more water-efficient products you save money on water and electricity bills and help the environment.
The rating system is similar to the energy rating labelling, with six stars. The more stars the better. As well as a star rating the labels also show a water consumption or water flow figure.
By 2021 Australians could save more than $600 million through reduced water and energy bills by simply choosing more efficient products. By 2021 it is estimated that using water efficient products will help to:
⇨ reduce domestic water use by five per cent or 87,200 megalitres each year;
⇨ save about 610,000 megalitres (more water than in Sydney Harbour);

Nearly half the water savings will come from more efficient washing machines, about 25% from showers and 22% from toilets. By choosing to use more water-efficient products in the home, Australians will save water and cut down on water and energy bills.
Showers with significant temperature drops (increase with distance from head) are considered ineffective
Showers with flow rates less than 7,5 lt/min, velocity superior to 10m/s cause a painfull spray effect
These aspects have to be considered to apply to WELS water efficient label.
Comparing the existing solutions with water efficient solutions we would have a reduction on water use in showers around 25% taps we would have reductions of 60% minimum.

In the World Energy Council Australia was included in the countries of Asia region. These Region included countries such as: East and Southeast Asia, Oceania, Central Asia, and the Middle East (Gulf States).
Asia has a energy production around 45%, positioning them as an energy supplier with large supply reserves for the future. Electricity supply expands along with the standard of living, boosted by its economic growth. Over the period to 2050, electricity consumption increases five-fold as a result of growing demand. Nuclear power plays a vital role in Asia, especially in China and India, which is predicted to account for about 70% of the nuclear power increase in Asia. Their share in primary energy production is anticipated to increase from 2% in 2005 to around 10% in 2050. New renewable sources of energy have to be encouraged, but developing countries cannot afford to be obsessed with it.




Minimum Energy Performance Standards (MEPS) Regulations in Australia: MEPS programs are made mandatory in Australia by state government legislation and regulations which give force to the relevant Australian Standards. Regulations specify the general requirements for MEPS for appliances, including offences and penalties if a party does not comply with the requirements. Technical requirements for MEPS are set out in the relevant appliance standard, which is referenced in state regulations. State based legislation is necessary because the Australian constitution gives Australian States clear responsibility for resource management issues, including energy.

Getting all the data together we can get a sum of countries more attractive in terms of water and energy policy savings that are a must when we talk abou sanitary water heating appliances:

| | Water Shortage | Water Policies | Low Energy Resources | Energy Policies | Energy/ Water Labels | Main affected regions/ countries |
|---|---|---|---|---|---|---|
| **Europe** | - | + | +/- | + + | + | UK; Spain; Greece; Italy |
| **Americas** | +/- | + + | +/- | + | + + | USA: California; Texas Mexico |
| **Oceania** | + + | + + | + + | + + | + + | Australia |
| **Asia** | + | + | + | + + | + | India; Thailand |
| **Middle East** | + + | + | - | + + | + | Emirates; Gulf countries |
| **Africa** | + | + | - | + | + | South Africa |

Table 1 Macroeconomic trends for each continent

## INNOVATION OPPORTUNITIES

Nowadays the studies show that the place where the most part of the water is spent in a household, refers to shower:
Even when we are talking about low flow showers these use at least 8l/min;
Usually water is heated centrally and than conducted to the bathrooms, which leads to energy waste (lost of heat while passing through the pipes).

So the product that adjusts to the macroeconomic trends will have the following features:

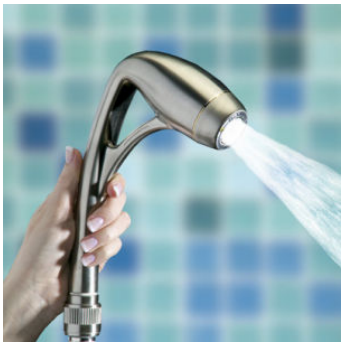
- ⇨ reduction of water flow to a level around 1,8L/min;
- ⇨ reduction of energy consumption (needs shown in macroeconomics trends);
- ⇨ point of use application (can be installed in a old bathroom without major modification on the installation place);
- ⇨ try to offer differentiation on the type of water dropping;
- ⇨ possibility of adapt the product to the kind of usage – flexible product;
- ⇨ create real unique selling proposition;
- ⇨ provide a mind thinking actions (market of domestic water heating with the thought that “less water flow=cold feet effect”)

There are already some ideas in the market with the aim of saving water, mostly, Here we present some ideas that get close to some characteristics , but aren’t able to fulfil all the items in the list.


Picture 5 Fog Shower

Fog Shower: With water shortages on the rise globally, and concerns over energy use rising every day, a shower that bathes you in a fog of microscopic droplets could be part of the solution. Brazilian design student Joao Diego Schimansky's Fog Shower is one of eight finalists in the 2007 Electrolux Design Lab competition. Reducing the amount of water used while showering saves water as well as the energy required to heat it. Typical water saving showerheads reduce flow and increase aeration, but the Fog Shower takes this to an entirely new level, bathing you in a directed fog of heated water vapor. Although only a concept now, the Fog

Shower, if produced, would use less than a twelfth of the water used by today's most efficient showerheads. [7]



Picture 6 Example of water saving showerhead

Save Water Without Losing Pressure With Our Showerhead: This innovative showerhead simply attaches to your existing fitting, conserving water and energy without sacrificing pressure. This amazing showerhead not only offers a truly revitalizing shower, but also makes water savings of between 30 and 70%. Its patented pressure technology accelerates, energises and oxygenates the water flow, allowing you to enjoy its massaging, deep cleansing sensation. The showerhead is easy to install onto any shower fixture (comes with hose and fixing kit) [8].

ECO-FRIENDLY SHOWER RECYCLES WATER: The Eco-shower re-circulates and cleans used water working on similar principles to a Dyson vacuum cleaner. The system uses filters and hydro cyclones to clean the recycled water and reheat it to the desired temperature. According to a BBC article on the subject, If Londoners were to jump in the eco-friendly shower, it would reduce the capital's water usage by 85 billion litres each year - the equivalent of 85,000 Olympic-sized swimming pools.
The Eco-shower has just won the British Standards Institution 2005 Environmental Design Award. Judges saw the design as particularly relevant, given the water shortages that have been predicted for London and many other parts of the UK.
Although the shower has some cool additional features, such as a chlorine filter, a water meter showing water usage per shower, and a pause button which allows water flow to be stopped until it hits the right temperature, Brewin predicts that the main commercial appeal of the shower will be its ability to save consumers money in their monthly bills [9].

These are just 3 of the amount of water saving showers that we can see in the internet. With the countries benefits regarding environmental friendly appliances this is a market niche growing everyday.

## MARKET ANALYSIS

With the already described characteristics for the water and energy saving, the target groups for potential users of the shower technology:

- ⇨ Hotel Chains – room and fitness centre showers; cost reduction for hotel chains; market visibility
- ⇨ Recreational Vehicles – auto-caravans; airplanes; boats & cruises; vehicles where water storage is an important topic
- ⇨ Domestic application – home showers; shower cabins; shower panels; Electrical instantaneous water heaters
- ⇨ Other opportunities: Hospitals, Health Clubs, SPA's, Public Toillets

## *HOTEL CHAINS*[B]

The top 10 Hotel chains represent more than 3.8 Mio rooms (01.01.07) [(1)]. Most studies indicate that hotels use between 350 and 750 litres of fresh water per occupied guestroom per day! [(2)], 56% of this consumption is in Showers/bath (including towels washing). [(3)]
"Green Hotel" is becoming a strategic operational initiative driven by the increase of environmental policies worldwide.

(1)Source: MKG Consulting
(2)Source: American Hotel & Lodging Assn
(3)Source: Sydney Water

In North and Central America (70% of American hotels market) more than 920,000 rooms are in pipeline for the next 3 years.

| Top Hotel Chains | Actual E2006 | | In Pipeline 2007-2010 | |
|---|---|---|---|---|
| | Nr. Rooms | Nr. Hotels | Potential new rooms | New Hotels |
| InterContinental Hotels Group | 558,153 | 3,863 | 221,787 | 1,535 |
| Wyndham Worldwide (Formerly Cendant Hotel Group) | 543,234 | 6,473 | 70,915 | 845 |
| Mariott International | 502,089 | 3,027 | 99,522 | 600 |
| Hilton Hotels Corp. | 497,738 | 2,900 | 154,473 | 900 |
| Accor | 486,512 | 4,121 | 188,891 | 1,600 |
| Choice | 429,401 | 5,300 | 69,514 | 858 |
| Best Western International | 315,401 | 4,200 | n.a. | n.a. |
| Starwood Hotels and Resorts Worldwide | 272,500 | 896 | 105,000 | 345 |
| Carlson Hospitality Worldwide | 145,933 | 950 | n.a. | n.a. |
| Global Hyatt Corp | 141,011 | 735 | 9,593 | 50 |
| **Total Rooms** | **3,891,972** | | **919,695** | |

Table 2 Top Hotel chains, actual and potencial new rooms

The critical success factors in this specific type of market are related to flexibility, design and possibility to connect with centralized or decentralised water heating system of the hotel.
In order to achieve all these goals some characteristics have to be defined during the product development, such as:

- ⇨ the reconstruction work must be minimized with plug and play and fast installation solutions to avoid the stop of hotel operations;
- ⇨ our product must be easy to adapt to existing bathrooms and be able to work with existing bathtubs;
- ⇨ premium hotels may require shower heads and faucet design to be similar;
- ⇨ Shower head solution has a neutral design to integrate in different design "atmospheres";
- ⇨ hot water in hotels is usually supplied by centralised heating system;
- ⇨ a solution for centralised water heating systems must be available (shower solution without the heating element, but including the other elements needed).

In order to have an overview of the market below is a SWOT analysis:

| Strengths | Weakness |
|---|---|
| ► High reduction on Hotels operational costs (Water/Energy)<br>► Easy to adapt to actual shower cabins<br>► Energy / Water labels<br>► No bacterial contamination<br>► Higher comfort in terms of temperature stability and waiting time<br>►Easy to maintain; when broken does not affect all building | ► Necessary reconstruction to install new product<br>► Different suppliers for faucet and shower head; potential different product designs<br>► Potential require of close cabin; Use in bathtub not assured yet<br>► More parts that can break |
| **Opportunities** | **Threats** |
| ► Reach a high number of sales units with small amount of customers<br>►Excellent market booster – high contribution for hotels brand awareness<br>►More new construction in pipeline for the next 3 years | ► Bathroom may require more than one appliance<br>► Hotels may require specific design |

In hotel chains market we have a range of opinion makers and purchase influence such as:
Labels

Consulting

Magazines

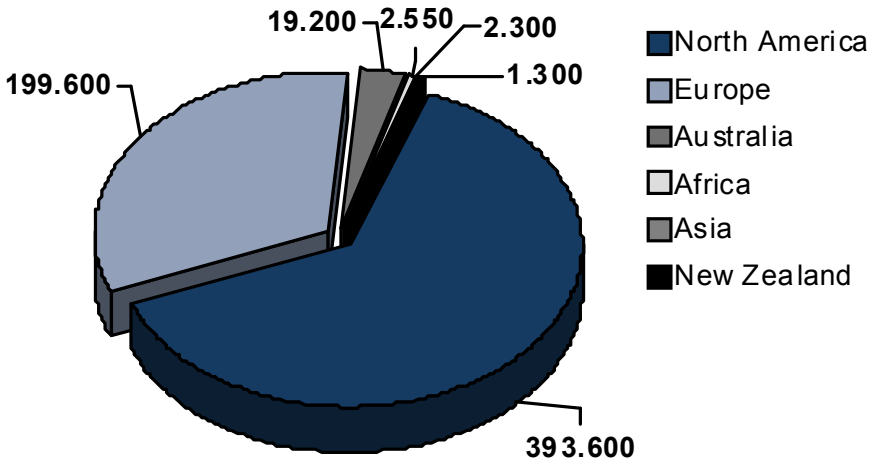
## *RECREATIONAL VEHICLES*

For recreational vehicles we consider three big segments which are:

- Caravans and Motor Caravans
- Airplanes (commercial and private)
- Cruises (commercial and private)

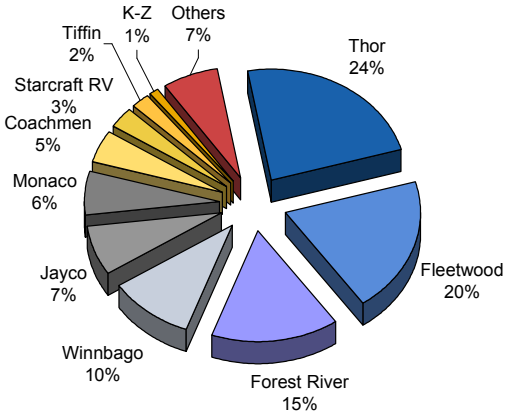
## CARAVANS AND MOTOR CARAVANS

Worldwide leisure vehicles(Caravans and Motor Caravans, 40%). In 2005 registration have reached 618k units(growth rate 4%).
In Motor Caravans the freshwater storage tank as a capacity from 100 – 130L, as in households the most critical point of water consumption is the shower. In this market the water heating solutions are dominated by Truma in Europe and Atwood in the United States of America. Usually the solutions in this market are a combination between water heating and central heating.
On average, a motor home costs 47 TEUR and a caravan/trailer costs 18 TEUR.
Worldwide United States of America is the biggest market for Caravans/Motor Caravans, followed by the European market:

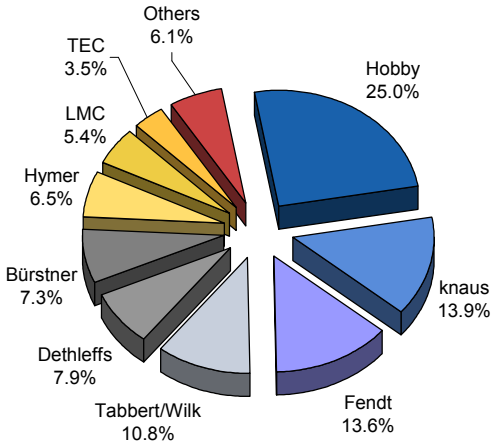



Picture 7 Worldwide Market for Caravans and Motor Caravans [10]

Regarding market shares of the top manufacturers in United States of America and Germany (represents 22% of the European market for Caravan and Motor Caravan):




Picture 8 United States Caravans and Motor Caravans market shares in 2006 (10)




Picture 9 Germany Caravans and Motor Caravans market shares in 2005(10)

Below we will describe the water heating systems more used nowadays in Caravans and Motor Caravans:

Electric Boiler (Caravan)

heating element with output of 850 W
stainless steel tank (V4A); capacity of 14 litres
compact dimensions (installation space: Ø 45 cm; height 29.5 cm); weighs: 3 kg
minimal heat loss (approx. 1.1°C/hr); EPP foam insulation
heating time - from 15°C to 70°C - 70 minutes
uncomplicated, rapid installation
easy to operate

suitable for fixed water connections (public connection) up to 2.8 bar (in combination with pressure reducer for pressures exceeding 2.8 bar)
Price: 436.03€

Combined electric boiler (Caravan)

compact (L x H x W) 370x230x220mm and easy to install
5 litre water capacity
water is heated by warm air distribution from heating system or using 230 V electrical heating element
heating time (approx. 50 min.)
convenient and easy operation
water is heated to 65°C under thermostat control
can be used with submerged pumps to maximum of 1.2 bar
Price: 185.27€

Gas water heaters (Motor caravans)

the stainless steel tank; capacities of 10 litres or 14 litres
the powerful 1500 Watt gas burner heats
the control panel is used to set the required temperature of between 30°C and 70°C – convenient, easy and variable
the compact dimensions
the electronic controls and pressure relief valve provide maximum safety
the thermostat-controlled shut-off and re-ignition facilities
Truma boilers are suitable for all submerged and pressure pumps up to 2.8 bar
economical gas consumption; efficiency level of approx. 95%
Price: since **627.41€ until 810.22€** due to boiler characteristics

Combi Gas Appliance – hot water and hot air (Motor caravans)

reddot design award winner 2007

DESIGNPREIS 2008 NOMINIERT

Temperature is continuously adjustable using the ergonomic control panel
Both the vehicle and the water are heated at the same time (winter)
Only the water is heated in summer operation
The unit has a efficiency level of up to 97% and low gas consumption
Water mixing is improved by the asymmetrical shape of the 10-litre stainless steel boiler, making the water heat more evenly and rapidly, providing longer showering enjoyment without having to adjust the temperature.
The heater can also be operated without filling the boiler
4 warm air connections provide optimum warm air distribution
The automatic, currentless FrostControl safety and drain valve opens at 3 °C and therefore prevents the boiler from freezing
The compact design provides a high degree of flexibility when selecting an installation site
The temperatures in the installation compartment are lower in comparison to the Trumatic C
Water, gas and warm air duct connections at the side make servicing easier
The innovative microprocessor controller provides additional safety
Price: since **1,508.21€ until 2125.64€** due to boiler characteristics

In order to have an overview of the market, below is a SWOT analysis:

| Strengths | Weakness |
|---|---|
| ▶ Low water & energy consumption<br>▶ Small and light weight<br>▶ Easy to integrate<br>▶ Instant and stable hot water<br>▶ No installation constraints | ▶ Requests: 110V/220V; 3.6kW<br>▶ Only hot water not hot air<br>▶ One unit per point of use<br>▶ TT has no experience in this market |
| **Opportunities** | **Threats** |
| ▶ Replace electric storage heaters<br>▶ Integrated shower solution for Truma and Atwood for motor caravans<br>▶ Adapt our product also for faucets | ▶ Duplication of hot water solutions for consumer (shower and faucet)<br>▶ Safety regulations<br>▶ Entrance market barriers |

In caravan and motor caravan market we have a range of opinion makers and purchase influence such as:

Suppliers

Truma (UK) LIMITED

ATWOOD MOBILE PRODUCTS, LLC

Associations

ECF European Caravan Federation

RVDA The National RV Dealers Association Powered by Dealers

CRVA Excellence ACVR

NATCOA NORTH AMERICAN TRUCK CAMPER OWNERS ASSOCIATION

Magazines

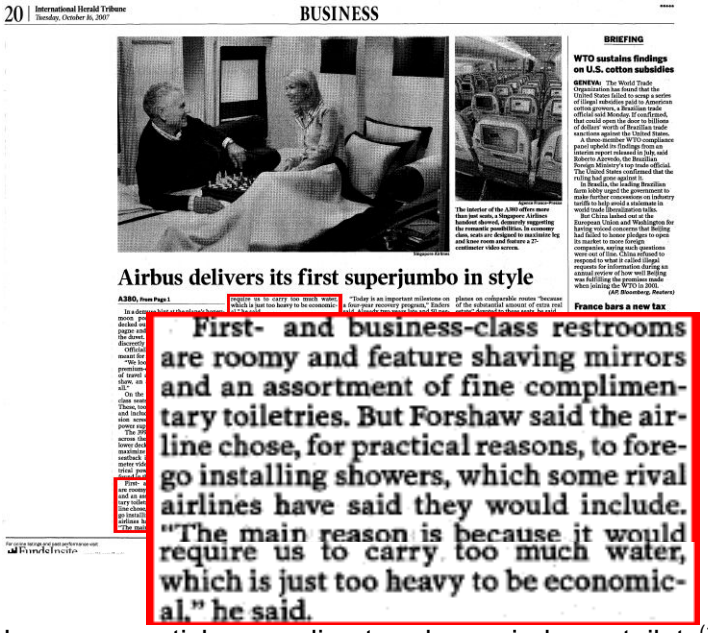
MotorHome INTERNATIONAL

## AIRPLANES

Air travel is a vital element of people's lives around the world.

Over the period 2006-2025, world passenger traffic is forecast to increase 4.8% per year. This means around 21,860 new airplane passengers with more than 100 seats; 1,666 large aircraft (7%) [11]. It is also forecast to be build 12,000 to 14,000 business jets over the next decade [12].

Nowadays private jets have already complete bathrooms, while commercial airplanes have now developed cabins for first class passengers (A380). The installation of showers is foreseen but due to water consumption has not been installed yet. The orders for 747 are expected to be 936 and grow until 2025.



20 | International Herald Tribune Tuesday, October 16, 2007

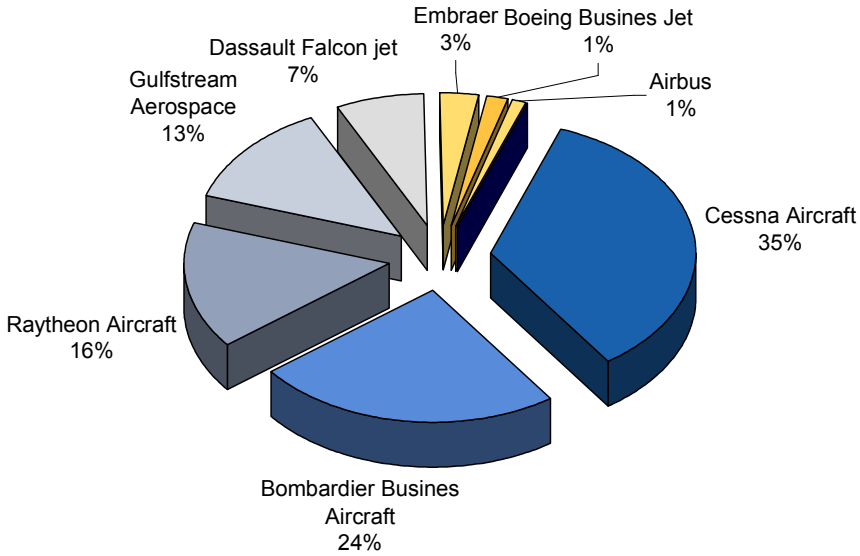
BUSINESS

Airbus delivers its first superjumbo in style

First- and business-class restrooms are roomy and feature shaving mirrors and an assortment of fine complimentary toiletries. But Forshaw said the airline chose, for practical reasons, to forego installing showers, which some rival airlines have said they would include. "The main reason is because it would require us to carry too much water, which is just too heavy to be economical," he said.

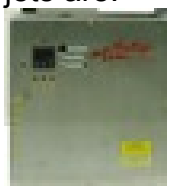
Picture 10 Newspaper article regarding trends on airplanes toilets[13]

In private business jets the total market in 2006 got to 885.




Picture 11 Total market share for manufacturers of private business jets in 2006[14]

The type of water heaters used today in commercial planes and private business jets are:



Keltech aircraft tankless water heater:
Range in size and capacity from 5 kw to 18 kw
Powered to operate at 400hz 115 volt phase to ground, Keltech tankless water heating solutions for aircrafts applications run at 208 volt AC with controlled 28 volt DC electrical supply.
Safety meet DO 160 vibration testing requirements, FAA burn testing requirements, and applicable Mil-Spec requirements

Water Heaters Designed by TIA for commercial aircraft and business jets:
Stainless steel tanks for potable water
20-45 PSI working pressure
Capacity: 48oz
Manual resettable thermostat for overheat protection
28 VDC and 115 VAC models available
Product support for life of aircraft

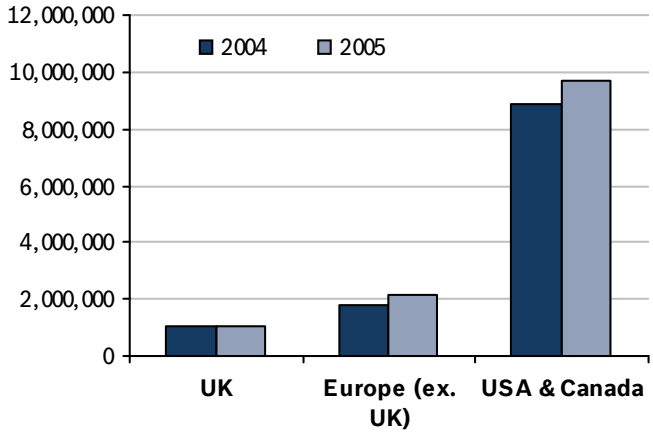
In order to have an overview of the market, below is a SWOT analysis:

| Strengths | Weakness |
|---|---|
| ► Low water & energy consumption<br>► Small and light weight<br>► Instant and stable hot water<br>► Potential mix with soap/ shampoo/ body care products | ► Requests: 110 V/220V; 3.6kW<br>► One unit per point of use<br>► Product base need to be adapted |
| **Opportunities** | **Threats** |
| ► Adapt product also for faucets for hand washing<br>► Provide new services to end-users<br>►Be the first to develop a shower water heater for commercial airplanes<br>►Market booster | ► Strict safety regulations<br>► Duplication of hot water solutions for consumer (shower and faucet)<br>► Low sales quantities<br>► Water capacities in airplanes |

## COMMERCIAL CRUISES

This is market expected to grow , the number of cruise passengers world wide is expected to increase from 14.4 Mio in 2005 (7.5% growth) to 20Mio in 2011. From

the 30 ships currently ordered, 20 will carry more than 3,000 passengers; six more than 4,000 and one more than 6,000! (average of 10 ships per year). Cruising is most popular amongst North Americans, 9.7 Mio in 2005 (Picture 12). The freshwater on cruises is usually provided by desalination units that transform the ocean water into usable water.




Picture 12 Cruising comparison between UK, Europe and USA & Canada [15]

Regarding Private Yachts the Luxury yacht order book increases by 15.3% (2007 figures), total of 777 yachts 25m and larger under contract, reaching a total of 28.8 km of luxury yachts. Sailboat builds increase by 13.5% and Motor yachts up 12.9%. The top 3 producing nations—Italy, the United States and the Netherlands—account for 65% of the total yacht footage under construction (Picture 13)

| Top 20 Builders | | | | |
|---|---|---|---|---|
| Yard Name | Total Length | Average Length | Number of Projects | 2006 Rank |
| 1 Azimut-Benetti | 10,859' | 117' | 93 | 1 |
| 2 Ferretti Group | 8,656' | 104' | 83 | 2 |
| 3 Sunseeker | 4,576' | 90' | 51 | 3 |
| 4 Rodriguez Group | 4,440' | 103' | 43 | 4 |
| 5 Trinity | 2,965' | 165' | 18 | 10 |
| 6 FIPA Group | 2,910' | 100' | 29 | 6 |
| 7 Feadship | 2,703' | 193' | 14 | 7 |
| 8 Lürssen | 2,569' | 257' | 10 | 8 |
| 9 Sanlorenzo | 2,558' | 98' | 26 | - |
| 10 ThyssenKrupp | 2,179' | 311' | 7 | - |
| 11 Horizon | 1,937' | 102' | 19 | 9 |
| 12 Heesen | 1,641' | 149' | 11 | 12 |
| 13 Westport | 1,538' | 128' | 12 | 11 |
| 14 Burger | 1,528' | 139' | 11 | 18 |
| 15 Perini Navi | 1,492' | 166' | 9 | 14 |
| 16 Camuzzi Nautica | 1,468' | 147' | 10 | - |
| 17 Rodriquez Yachts | 1,174' | 130' | 9 | - |
| 18 Hatteras | 1,140' | 81' | 14 | 15 |
| 19 Amels | 1,108' | 185' | 6 | 19 |
| 20 oceAnco | 1,057' | 264' | 4 | - |

Picture 13 The top 20 yacht builders, number of projects and rank position (16)

In this market the type of water heaters used are boilers supplied by Truma too:

stainless steel boiler with 10 or 14 litre water capacity
powerful gas burner (1300 W) provides
fast heating times up to approx. 70°C:
10 litres approx. 35 minutes
14 litres approx. 50 minutes
12 V control voltage (supply voltage for controller)
continuously variable heating between 30°C and 70°C
special version Boiler BM 10 EL or BM 14 EL electrical heating 230 V, 850 W
economical gas consumption due to high efficiency level (approx. 95%)

In order to have an overview of the market, below is a SWOT analysis:

| Strengths | Weakness |
|---|---|
| ► Low water & energy consumption<br>► Small and light weight<br>► Easy to integrate<br>► Instant and stable hot water | ► Requests: 110/220V; 3.6kW<br>► Only hot water not hot air<br>► One unit per point of use |
| **Opportunities** | **Threats** |
| ► Use the same concept solution as hotels<br>► Enter a new market<br>► Adapt shower show also for faucets<br>► Reduction of water storage capacities | ► Duplication of hot water solutions for consumer (shower & faucet)<br>► Safety regulations<br>► Entrance market barriers |

To have a overall view of the recreational vehicles market and the attractiveness regarding each segment a conclusion table was done:

| Leisure Vehicles | Quantities forecasted | Product adaptability | Product "booster" | Market attractiveness |
|---|---|---|---|---|
| Caravans | + | +/- | - | +/- |
| Motor Caravans | + | +/- | - | +/- |
| Commercial Airplanes | - | +/- | + | +/- |
| Privat Jets | + + | +/- | - | + |
| Commercial Cruises | + + | + | + + | + + |
| Privat Yachts | + | + | - | + |

Table 3 Quotation of recreational vehicles segments

According to the analysis, commercial cruises represent the most attractive market on the recreational vehicles segment. Regarding market size, growth trends and product similarity on the commercial market the hotel chains have to be consider the target group.

## *DOMESTIC APPLICATIONS*[B]

Analysing the domestic application for showering there is a big variety of product type.

Showerhead:
This is the most basic application and usually has a showerhead, a hose, a slider and faucets. This Kind of application is common and is not applicable when the product has to have severall elements to be able to fill all the requirements.

Picture 14 Example of a showerhead

Electric Instantaneous Shower:
This is a type of shower mostly used and sold in UK and Brazil. Usually the power output range is between 3kW and 9kW. Is used as a point of use and is installed on a shower wall.

Picture 15 Example of Electric Instantaneous showers

Shower Panel:

Also known as shower columns, it does not have any integrated water heating appliance, benefiting instead of the centralized water heating units. These equipments often have from 4 to 12 water jets and deliver hydro massages. With this type of power jets it is difficult to transform them into water savings or even energy savings. They are installed on the shower wall or are floor standing.

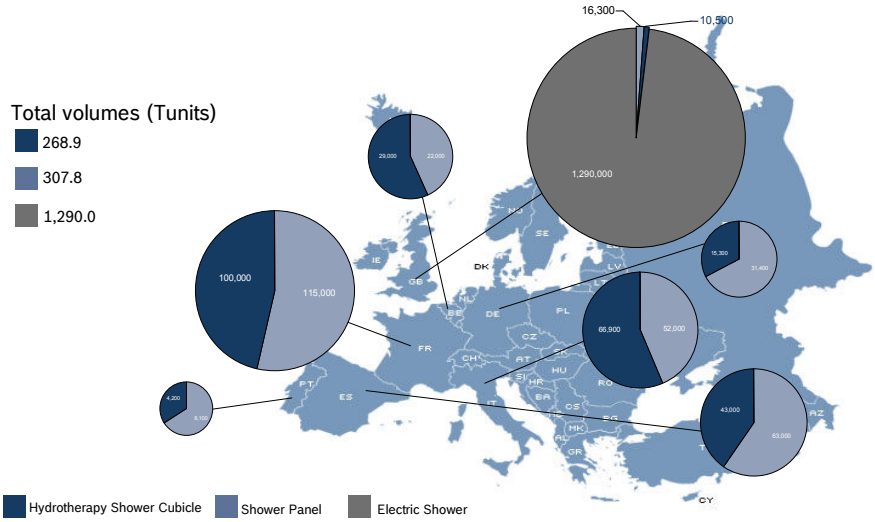
Picture 16 Examples of Shower Panels

Hydrotherapy Shower Cubicles:

Shower Cubicles or Cabins, which are complete, usually 4-sided, stand alone units with their own shower trays. This analysis is focused in hydro massage units (luxury products).

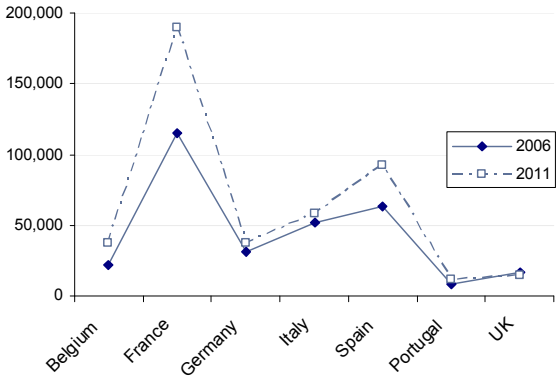
Picture 17 Examples of hydrotherapy shower cubicle

For all this application types we have a market volume in European Market.



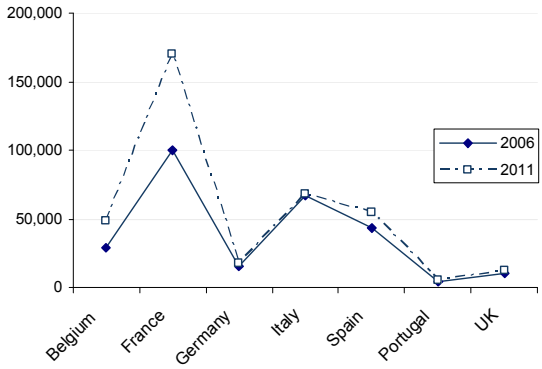

Picture 18 Domestic Aplications Market volume in thousand units for 2006

Below the trends on this market can be analysed in shower panels and hydro cubicles. The overall market volume growth from 2006 until 2011 is of 28%. Prevision of 816,7 T units, excluding electric showers, for 2011.
For shower panels a growth of 29% is expected for 2011. This market is mostly a replacement one.



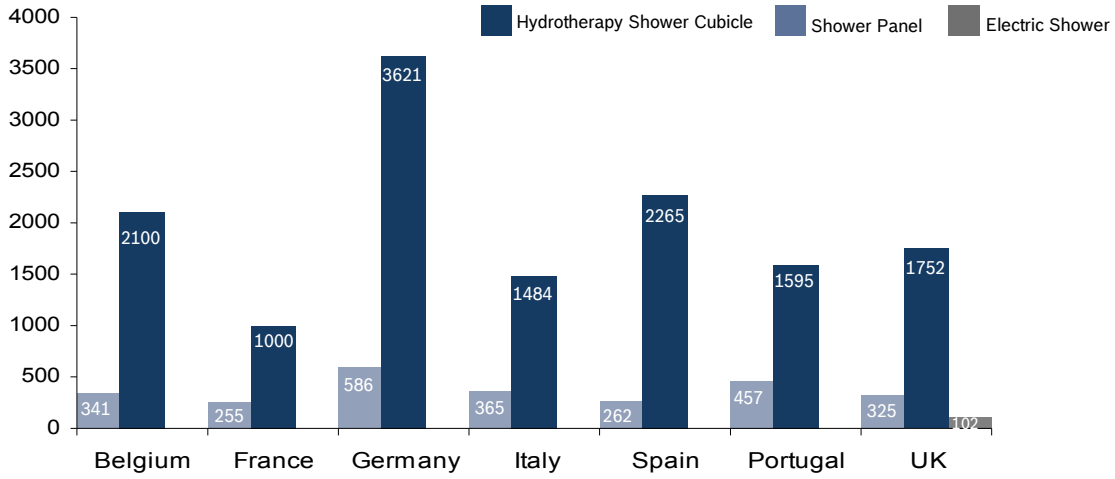

Picture 19 Market growth for Shower panels between 2006 and 2011.

For hydro cubicles a growth of 25% is expected for 2011.



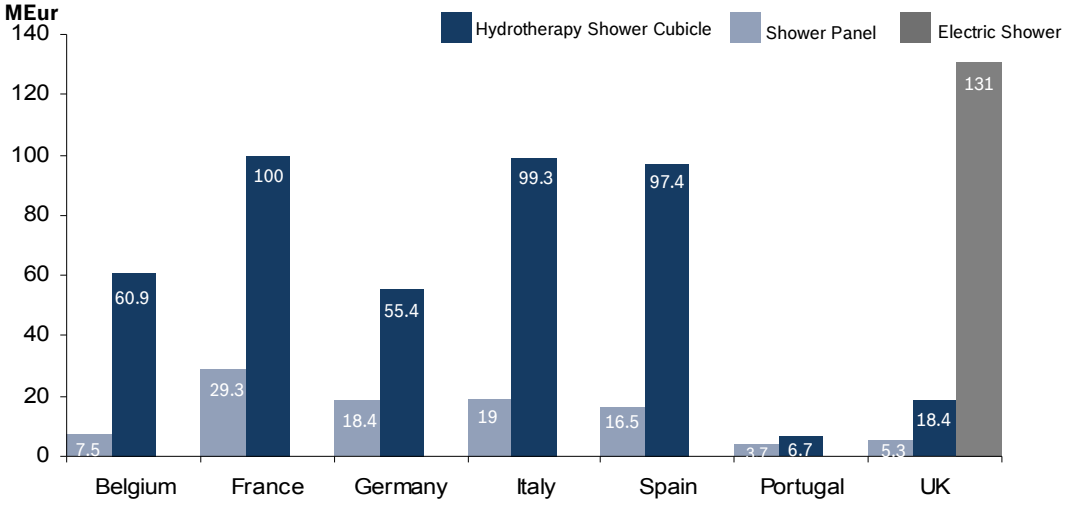

Picture 20 Market growth for hydro cubicles between 2006 and 2011

Analysing the average net prices by country, in Europe, we can see that Germany shows the highest prices in hydro therapy cubicle and in shower panels. Regarding electric showers the only country that has sells on this type of product is the UK (Picture 21).




Picture 21 Average net prices by country in 2006 in euros

The total market value is of 669 Mio EUR. The most valuable market on 2006 was the electric shower market in UK, followed by hydro therapy cubicles in France. In the shower panel market the country with the higher market value is France too (Picture 22).




Picture 22 Market value in Mio EUR in 2006

The main market players in west European market in 2006 for Shower panels was Valentin from Valentin brand with a market share of 17%; in the Hydro cubicle market was Tab from Tab brand with a market share of 8.5% and in the electric Shower was Norcros from Triton brand with a market share of 46.5% (Picture 23).

This markets are clearly dominated by Italian brands and is highly fragmented, except for electric showers.

| Shower Panel | Brands | TUnits | Market share | Hydro. cubicle | Brands | TUnits | Market share |
|---|---|---|---|---|---|---|---|
| Valentin | Valentin | 57.5 | 17.0% | Tab | Tab | 26.3 | 8.5% |
| Masco | Glass Idromassagio; Hnasgrohe; Huppe; Bristan | 43.7 | 12.9% | Novellini | Novellini, Novo | 21.7 | 7.1% |
| Roca | Roca; Sanitana; Gala | 19.2 | 5.6% | Teuco Guzzini | Teuco Guzzini | 21.5 | 7.0% |
| Grohe | Grohe | 17.8 | 5.2% | Sanitec | Leda; Keramag; Domino; Sphinx | 14.1 | 4.6% |
| Teuco Guzzini | TeucoGuzzini | 16.4 | 4.8% | Calodar | Calodar | 12.0 | 3.9% |

| Elect. Shower | Brands | TUnits | Market share |
|---|---|---|---|
| Norcros | Triton | 600 | 46.5% |
| Kohler | Kohler Mira | 330 | 25.6% |
| Aqualisa | Grainsborough | 132 | 10.2% |
| MDA | Redring | 95 | 7.4% |
| Glen Dimplex | Galaxy | 36 | 2.8% |

Picture 23 Main players (holdings) in west European markets for shower panels and hydro Cubicle in 2006

For the Manufacturers the overall fact and figures are:
Market size forecast 2011 (units)
⇨ Hydro. Cubicles: 224.000
⇨ Shower panels: 78.000
Market value 2006 (Mio EUR):
⇨ Hydro. Cubicles: 170
⇨ Shower panels: 26
Main players:
⇨ Hydro Cubicles: Jacuzzi; Kohler and Masco (Hansgrohe brand)
⇨ Shower panels: Kohler, Grohe and American Standard
Distribution
⇨ Professional wholesale (>50%)
⇨ Home centers (>20%)

Below it will be represented the main features in this type of products in the market players.
Shower Panels

Picture 24 Examples of different types of Shower panels

Main Feature
Thermostatic taps
temperature setting
Adjustable body sprays
Overhead shower with air mixing
4 to 8 hydro-massage jets
Steam bath option
LCD, light
Fashionable design

Hydro therapy shower cubicles:

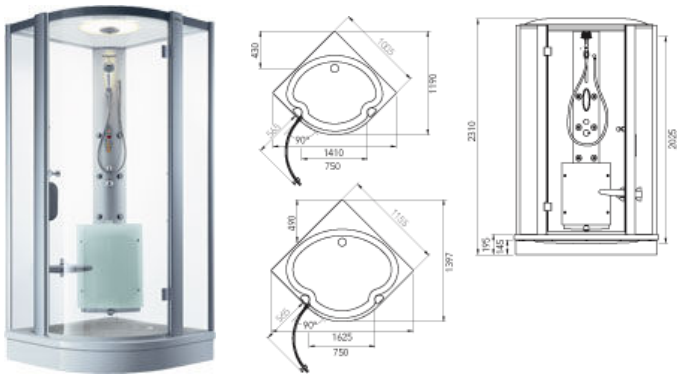
Picture 25 Models Absolute and Star 3 from tab brand

Main Features:
Electronic control display of the cabinet's main functions, hydromassage shower head steam generator and lighting
Shower cover with central fitted shower head
Shower cover with 8 led lighting
Water temperature control

10-16 antiscale hydromassage jets
Aromatherapy dispenser
Scottish shower (alternate cold and hot jet streams)
Cromotherapy

Hydro therapy shower cubicles:

hansgrohe



Picture 26 Model K4 Sensotronic Steam

Main Features:
Thermostatic mixer with scald protection and separate valve for cascade shower
Control unit for shower operations, steam- fragrance-, lightcontrol
Adjustable steam output (up to 60 minutes) and intensity (30-100%)
Adjustable fragrance intensity (70 - 100 %)
LCD display indicates:
water temperature
desired timing of cascade function
steam output in minutes
desired steam output in %
desired fragrance output in %
cabin temperature
Illuminated symbols at the display

Analyzing the main countries in this kind of market in Europe an introduction plan can be defined.
The Belgium market is characterized by hydrotherapy shower cubicles as the most popular product. Sales in this type of product experienced a growth of 16% in 2006, which was especially visible In the professional segment, shower panels have been increasing, especially in DIY. The expected market growth for hydrotherapy cubicles and shower panels between 2006-2011 is approximately 40%. The replacement market for these 2 products is predicted to reach 87% until 2011.

- ⇨ Main Players (Holdings):Shower Panels: Calodar (25%), Keter (22.7%), Grohe (19.1%), Masco (13.6%). Hydro. Cubicles: Calodar (41%), Tab (14%), DBSI (4%)

- ⇨ Distribution (2011): Shower Panels: Retailers/Wholesalers (78 %); DIY (40%); Specialists (20%). Hydro.Cubicles: Retailers/Wholesalers (92%); DIY (8%); Specialists (62%)

The French market increased 17% in 2006 for the hydrotherapy market. Hydrotherapy cubicles and shower panels had the trongest growth. The enter of Chinese products in these two markets and the continuous grow of share is pushing the prices down. Untill 2011 these products will own 67% of the replacement market.

- ⇨ Main Players (Holdings): Shower Panels: Valentin (50%), Masco (5%), Grohe (5%). Hydro. Cubicles: Tab (15%), Novellini (7.5%), MJ industries (7%).
- ⇨ Distribution (2011): Shower Panels: Retailers/Wholesalers (37 %); DIY (65%); Specialists (4%). Hydro. Cubicles: Retailers/Wholesalers (25%); DIY (61%); Specialists (5%). Strong penetration of cheap imports, mainly from China, distributed through DIY stores, pushing upper-end products to the wholesale channel.

In the Germany market sales of shower panels are growing significantly. The biggest end user for these products is house renovation and the demand for the commercial sector (hotels, spas, etc) is increasing. Until 2011 the replacement market is expected to account for 80% for both product types.

- ⇨ Main Players (Holdings): Shower Panels: Masco (46.3%), Grohe (10.2%), Dusar (7%). Hydro. Cubicles: Masco (19.6%), Sanplast (12.4%), Dusar (12%)
- ⇨ Distribution (2011): Shower Panels: Retailers/Wholesalers (76 %); DIY (24%); Specialists (6%). Hydro. Cubicles: Retailers/Wholesalers (81%); DIY (20%); Specialists (6%).

Italian market continues to loose share from hydro massage baths (largest market) to hydrotherapy cubicles, this consists with the trend towards shower instead of bath. The increase of hydrotherapy cubicles for 2006 was around 4.5%.Since the hydrotherapy cubicles have reached its peak on their life cycle this market its expected to decline. The companies are now investing in R&D hoping to diversify and specialize these products. The replacement market it's expected to reach 57% until 2011.

- ⇨ Main Players (Holdings): Shower Panels: Teuco (16%), Jacuzzi (13.7%), Novellini (11%). Hydro. Cubicles: Teuco (22.4%), Novellini (15.5%), Jacuzzi (11.4%)
- ⇨ Distribution (2011): Shower Panels: Retailers/Wholesalers (78 %); DIY (12%); Specialists (22%). Hydro. Cubicles: Retailers/Wholesalers (78%); DIY (4%); Specialists (21%).

In Spanish market the shower panel enterd the new construction market raising its sales in 5% in 2006. Besides these growing rates this sector is not increasing as it could due to lack of interest of property developers. Main part of sales are in renovation sector, most of them when replacing a bath. It is expected for the replacement market to grow for both product about 73% until 2011.

- ⇨ Main Players (Holdings): Shower Panels: Roca (15%), Teuco (8%), Banacril (8%). Hydro. Cubicles: Roca (19%), Porcelanosa (13.5%), Teuco (6%)

- ⇨ Distribution (2011): Shower Panels: Retailers/Wholesalers (55 %); DIY (20%); Specialists (20%). Hydro. Cubicles: Retailers/Wholesalers (75%); DIY (6%); Specialists (19%).

United Kiigdom market is characterized by an increase of sales in hydrotherapy cubicles in 2006 of 13.3% to reach 10,500 pieces. Shower panels is estimated to decrease significantly over the next years. In electric showers segment the market is expected to be stable mostly due to replacement market. The replacement market is expected to reach 80% on all product types by 2011.

- ⇨ Main Players (Holdings): Shower Panels: Norcross (37%), Ultra (23%), Masco (10%). Hydro. Cubicles: Tab (30.5%), Aqualux (19%), Porcelanosa (14%). Electric Showers: Norcros (46.5%), Kohler (26%), Aqualisa (10%).
- ⇨ Distribution (2011): Shower Panels: Retailers/Wholesalers (31 %); DIY (24%); Specialists (45%). Hydro. Cubicles: Retailers/Wholesalers (28%); DIY (0%); Specialists (72%). Electric Showers: Retailers/Wholesalers (53%); DIY (38%); Specialists (9%).

The critical success factors in this specific type of market are related to access to distribution channels, design and specifications, price positioning and brand awareness.
In order to achieve all these goals some characteristics have to be defined during the product development, such as:

- ⇨ shower panels: majority through wholesale/retail with the exception of France (DIY);
- ⇨ hydrotherapy cubicles: majority through wholesale/retail with the exception of the UK (specialists/plumbing);
- ⇨ electric showers: mainly through wholesale/retail (only UK in EU);
- ⇨ the main market is for replacement, therefore the new product development must consider dimensions and fittings compatible for each market;
- ⇨ both shower panels and hydrotherapy cubicles are typically oriented for wellness and well being, including several taps/jets and additional features (cabin heating, chromo therapy, fragrance therapy, etc). The exceptional comfort feeling as well as additional value through features, should be considered on top of the water saving benefit;
- ⇨ aesthetic design plays a major role in this product segment;
- ⇨ price is a critical factor specially concerning DIY channel;
- ⇨ average net prices: shower panels 320EUR; hydro. cubicles 1500EUR; elect. showers 102EUR;
- ⇨ price setting regarding shower panels and hydrotherapy cubicles must be competitive with the average figures above, in spite of “shower show” product having further components (pump and water heater);
- ⇨ branding our product range under premium brands with relevant awareness amongst end consumer seems critical, due to the existing distribution channels and very well established brands in the markets, such as: Italy, Belgium, UK, Germany, Spain and France.

In this kind of market the use of shower instead of bath has been increasing due to more demanding lifestyles and the recognition that shower can have equal

relaxation benefits as a bath. These trends and the innovative features that all shower market started to develop increased its attractiveness.

In order to have an overview of the market, below is a SWOT analysis:

| Strengths | Weakness |
|---|---|
| ► Low water and energy consumption<br>► 2 years pay back period comparing with instant electric shower<br>► Potential mix with soap/ shampoo/ body care products<br>► Higher comfort in terms of temperature stability and waiting time | ► Need to have side walls<br>► Uncertain capability for including more than one tap in the system<br>► "cold feet" effect<br>► Potential moisture problems |
| **Opportunities** | **Threats** |
| ► Assuring Energy / Water labels<br>► West European markets and further chances in US, Australia, Brazil, north Africa, United Arab Emirates and China, based on the water restrictions policies<br>► Capitalize on existing brand awareness (mainly Bosch) and/or to create an anchor brand (ex.: nespresso, intel, teflon) | ► Price pressure on the DIY channel<br>► Weak access to main distribution channels (wholesalers and retailers), with the exception of the US market<br>► Market dominance of existing manufacturers mainly in UK, Germany and France<br>►Price levels shower panels 320EUR, hydro. cubicles 1500EUR; elect. Showers 102EUR |

## *POINT OF USE FOR SHOWER AND FAUCETS*

There are other business opportunities in a product with this type of characteristics, such as:
⇨ Hospitals
⇨ Health clubs
⇨ Spa's
⇨ Public toilets

Regarding Hospitals they have features that maybe appealing for this kind of application. Only in EU there were 2.3 Mio hospital beds in 1999 [(17)]. In average an hospital spends 500k Litres per day, from which 24% are for domestic use (shower, toilet, faucets) [(18)]. Bed rooms/ Urgencies/ Operation rooms/ …

In the Health Club and Spa's market in the European Union there are almost 37k fitness clubs [(19)]. Representing 550k showers, with daily water consumption above 180 bn Litres only for showers [(20)]. Additionally there is the energy consumption to heat this water.

| IHRSA 2006 | EU | USA | LAM |
|---|---|---|---|
| Fitness Clubs | 36,900 | 29,069 | 12,810 |
| Members | 38.65 | 41.3 | 7.61 |

Table 4 Number of Fitness Clubs and Members in European Union, United States of America and Latin America.

Related to Spa's there was no information available.

The Public Toilet market can be analysed mainly from the perspective of faucets, since not all public toilets have showers. If this could be done the opportunities emerging would be regarding International airports, main train stations, bus stations, public buildings and museums.

Concluding for this type of market opportunity we reach to the following table:

| | Main requirements | Challengers |
|---|---|---|
| **Shower** | - user friendly<br>- multi-points of use<br>- easy to adapt | - fixed vs mobile shower head<br>- central vs Local water heater |
| **Hand-wash** | - soap mixture<br>- handwash program<br>- activate sensor | - mixture of soap and water in point of use |
| **Other faucets** | - option of continuous flow<br>- with and without temperature | - easy switch between continuous and atomized flow |
| **Spa's** | - special effects/ massages<br>- moisture effect<br>- mix with other fluids<br>- cabines | - creation of new product in Spa's |

Table 5 Main requirements and challenges for point of se market

## BUSINESS MODEL

After viewing all the Swot analyses we get to several points of business model.
Hotels represent the most attractive target group to start activities. This market has a big market potential with growth; few key partners easily identifiable; perfect product fit; high visibility and booster effect; win-win situation. Commercial Cruises ("floating hotel") can be considered as "hotels", thus further enlarging the potential of this target group. Hotel chains will be the ideal target group to focus on to enter market and position product concept and brand.
Domestic Applications (market size and potential) offer the possibility to enter mass-market (leverage effect). Access to distribution, product costs and design are critical success factors. Cooperation with Sanitary Industry partners or suppliers will be a key.
On the Recreational Vehicles, additionally to Commercial Cruises market we have to consider all the segments. Motor Caravans, Caravans and Private Yachts offer good opportunities to extend product penetration (clearly Identified players, product fit). Commercial and Private airplanes represent a fantastic opportunity of "marketing and advertising" our concept, however limited volume and stringent safety regulation might restrict the attractiveness of this target group.

## *COMPETITIVE STRATEGY PROPOSAL*

Thermotechnology not only produces its own branded consumer products, it also produces technologies that are incorporated into other manufacturer products. Both approaches are possible for our product technology. Thermotechnology could produce its own branded product and sell it alongside its household appliances. Or it could develop the technology and licence it to established manufacturers of bathroom fittings. Bosch could develop a brand for its new product that becomes synonymous with water and energy savings – environmental friendly.
What were consider the best approach was the introduction in domestic applications market with a co-development and market launch with a sanitary partner. A partnership is the best way to enter this type of market, since it’s a brand driven market. Bosch would contribute with its expertise in water heating technologies and the sanitary partner would be responsible to develop the design, the several variations of this product to the different applications and together the market introduction responsabilities would be divided between the two companies.
Different applications would be related to shower panel, shower cubicle, electric instantaneous shower and a possible faucet with the characteristics defined in terms of water and energy savings. (first type of applications to be introduced) (second variants of the application to be introduced)
The distribution channels will be defined taking in account each partner capabilities. When Bosch Thermotechnology has the best know how in a distribution channel the distribution should be done through TT, when our partner has the best know how, our partner should be responsible for those distribution channels.

The first introduction would be in the panel shower and cubicle shower product type. For the shower panels the best brand to make the partnership would be Valentin but for the hydro cubicle the best partner would be Tab. In order to include both product type and have a strong partner on both market the partnership should be done with Teuco Guzzini. The markets where this introduction would be done first would be in western Europe, North America and Australia due to the environmental regulations on the path of saving water and energy (bases for our innovative product). In these countries the best entrance would be through the hotel chain and domestic applications. This would be the first part of the market introduction.
A second step for market introduction would be expand our product for point of use application, like faucet and electric instantaneous shower. If the segment shows expansion we could introduce in other markets facing water scarcity like Asia and Africa. The distribution channels should be done as defined in the beginning. If this type of product gains market share and application we can after expand to such different and attractive applications as motor caravan and cruises which are the most needy in terms of water saving market segment.

Analysing the chances of this business model it has lower costs and quicker research development we develop only the part were our expertise is, and our partner develops the parts were he has its expertise. It opens a wider distribution network gathering the best know how from each partner. Increase o productivity and the possibility to introduce the faucet solution sooner.
There are risks to take in account like trust conflicts, uncontrolled flow of know-how, intellectual property rights has to be shared to its full extent and strong dependency.

## *CONFIGURATION OF ACTIVITIES*

In this type of product one of the main issues is related to the marketing of this type of characteristics for this type of market. Everyone can agree that energy saving it's not a problem but when we talk about water saving in this type of market (showering) people get suspicious. The only way to reduce this mind thinking it's to "offer" a shower to the end-user.
One of the ways to show people that what we promise is feasible is to have our product installed in commercial places, like hotels, spa's, health clubs and support it with visual marketing showing the selling points; mainly the environmental friendly feature.
Other marketing proposal it's a combination of our products advertising in combination with our new product. In the countries we are thinking of enter install a solar system to supply water heating with photovoltaic cells (partnership with a manufacturer of this technology) to supply electricity to our product and place them in the most known beaches. Introducing this to the end user and offering a "flavour of summer" to our product.

## *POTENCIAL REVENUE GENERATION AND MARGINS*

According the different markets analysed the possibilities are defined on the table below:

| Market segments | Market size* | Market evolution | Product fit | Entrance barriers |
|---|---|---|---|---|
| **Hotels** | 920.000 rooms | 7% Year | High | Medium Weak |
| **Recreational Veichles** | | | | |
| *Motor caravans* | 247.000 units | 4% Year | Medium | Medium |
| *Caravans* | 370.000 units | 4% Year | Low | Medium |
| *Commercial airplanes* | 936 units | na | High | Strong |
| *Private jets* | 885 units | 60% Year | High | Strong |
| *Commercial cruises* | 32.000 rooms | 2-4% Year | High | Medium Weak |
| *Private yachts* | 777 units | 15% Year | High | Medium Weak |
| **Domestic Applications** | | | | |
| *Shower panels* | 390,000 units | 6-7% Year | Medium High | Medium |
| *Hydro cubicles* | 490,000 units | 4-6% Year | Medium | Medium |
| *Point of use* | 1 Mio units | 1% Year | High | Strong |

Table 6 Overview of target group potential according data in market survey

## CONCLUSIONS

Nowadays water saving is a prominent ecological issue. Regarding Domestic water heating the main water consumption is done on showering. Therefore it is not surprising that a number of companies and institutions are considering how to reduce the water consumption of the domestic shower. With a macroeconomic study the innovative product (shower or faucet) would be able to reduce water and energy consumption, allow heating on demand on point of usage, provide a new sensation, offer new body care, create real unique selling proposition and change paradigm about “less water flow equals cold bath”. After a market analyses we got more characteristics that would enhance our product attractiveness such as: easy to install (unit has to be easy to install and also take into account the customers existing fittings and bathroom environment should not require major alterations or reconstruction), flexibility in type of configuration so it could be replacing an existing electric shower, attaching to a shower hose outlet and replacing an existing cubicle type of shower.

By the markets analyse the business model should be define the first entrance in domestic applications, since this market as distribution constraints the best way to introduce our product should be creating a cooperation with sanitary Industry partner or supplier. Bosch could launch the technology with a partnership with Teuco Guzzini (sanitary company with better market share in shower panel and hydro cubicle), emphasising its ecological advantages and focusing on the mid-price market. The entrance would be done first into the most open market to this kind of features like Western Europe, North America and Australia. Once the brand is established the technology could then be licensed to manufacturers of luxury, designer bathroom fittings, allowing Bosch to access a market that would otherwise be difficult to penetrate.

After all these main conclusions were defined we are able to develop a innovative product with a well defined market entrance and success characteristics that will turn this product a premium one.

The product that will be developed will fit nowadays needs and trends, with a suitable strategy towards the markets that value the core features of the product. Innovation was found in analyzing our everyday life, world trends and direction and how to evolve from where we are to where we would like to be.

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