

Greening the industry

In 2010, US-based magazine *Newsweek* ranked the largest publicly traded companies across the world in terms of how green they were, and no less than a fifth of the top 20 ranked organisations were global pharmaceutical firms.

Johnson & Johnson, GlaxoSmithKline, Novartis and Pfizer all made the top 20 in the publication's 'Green Rankings'. The results were compiled in association with MSCI ESG Research, a leading source of environmental, social and governance ratings; Trucost, which specialises in quantitative measurements of environmental performance; and CorporateRegister.com, the world's largest online directory of social responsibility, sustainability and environmental reports.

While sustainability is still a relatively new concept regardless of industry, Big Pharma is clearly keeping up with its technology, banking and retail counterparts.

Pfizer is the perfect example. With environmental credentials stretching far beyond a few token sustainability initiatives, its programmes range from lighting upgrades to chemical waste reduction, from building design to manufacturing techniques.

Integrated approach

In 2009, the launch of Pfizer's Environmental Sustainability Programme marked a new step in the pharmaceutical giant's sustainability efforts. The initiative, according to Marty Brown, director of Pfizer Global Engineering, was created "to build on [the company's] already established and recognised green

While some industries talk about going green, the pharmaceutical sector is already there.

Elly Earls catches up with the team at **Pfizer** to learn about the importance of employee participation in sustainability programmes and the significant strides the company has made in both green chemistry and green design.

chemistry programme and carbon emissions reductions, and to fully integrate environmental sustainability into the company's business operations". The programme is governed by Pfizer's Environmental Sustainability Council, which is made up of senior leaders from across the company.

Employees in Pfizer's research and development (R&D) and manufacturing operations are continuously reviewing processes to identify opportunities to improve efficiencies and reduce material usage. Utilities, including heating, cooling, electricity, purified water and compressed air and nitrogen, are a key part of this.

"Systems producing and distributing each of those utilities need to be monitored for leaks, conversion losses and drifting set points," says Brown. "In addition, employees are searching for ways to incorporate improved technologies into operations." >>

“ We have recently conducted a full ‘cradle-to-gate’ lifecycle assessment... and have found that, between 2007 and 2020, the new biocatalytic process will eliminate approximately three million tonnes of CO₂ emissions. ”

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Quality in your hands

Over the past seven years, Pfizer's worldwide network of energy teams has implemented more than 2,400 energy-saving projects across the globe, reducing the firm's annual greenhouse gas emissions by the CO₂ equivalent of more than 600,000t.

Some of the more common energy- and cost-savings projects include:

- lighting upgrades
- boiler combustion control improvements
- waste heat recovery
- shut down during non-production hours
- chilled water control optimisation
- retro commissioning
- reduction of air exchange rates.

With HVAC (heating, ventilation and air conditioning) potentially accounting for 60-70% of a facility's energy costs, this is something Pfizer has really been concentrating on.

"For the past several years, a number of on-site energy teams have been focused on optimising the operation of their HVAC systems using a risk-management methodology," Brown elaborates.

“ From managing the operation of energy-intensive manufacturing equipment to producing double-sided paper copies and recycling waste, employee behaviour has a significant impact on conservation efforts. ”

Following this approach, changes to hours of operation, temperature set points, humidity control and air exchange rates have yielded significant reductions in energy usage and greenhouse gas emissions. "Management of HVAC operations has been the single biggest contributor to the efficiency improvements and operating cost reductions we have realised," Brown emphasises.

Waste reduction and recycling are also important elements of Pfizer's ESP, and the company currently has waste minimisation efforts for most of its hazardous waste streams at its larger sites. "We also have an internal goal to reduce our non-special waste (normal trash and other non-hazardous waste)," says Scott Smith, manager, environmental, health and safety audit, Pfizer. "A key element of Pfizer's waste minimisation plans includes the application of a waste management hierarchy focused on avoidance, reduction, reuse and recycling."

Ambitious goals

Still not satisfied with its achievements, Pfizer, which follows the World Resources Institute Greenhouse Gas accounting protocols for reporting carbon emissions, set itself an ambitious goal to reduce greenhouse gases from internal operations by 20% between 2007 and 2012. "To help achieve this goal, energy efficiency

improvement targets were set for individual operating sites," explains Brown. "A web-based project tracking database is used to collect, report and share across the network of energy, water, greenhouse gases and cost-savings projects. We are pleased to confirm that we are on track to meet our goal."

Without support and participation from employees across all departments, this goal would certainly not be met, which is why the company's goals are shared with all members of staff. "From effectively managing the operation of energy-intensive manufacturing equipment to producing double-sided paper copies and recycling cafeteria waste, employee behaviour has a significant impact on conservation efforts across all areas of the business," Brown notes.

"So to raise awareness of the impact employees can have, a number of communication channels are used. Newsletters, plasma screen messages, recognition programmes and dedicated awareness campaigns (such as Earth Day) are regularly used to inform and educate employees on how they can contribute to reducing the environmental impact of business operations."

Pfizer's Green Chemistry programme is one of the organisation's most established contributions to sustainability. "It's been running for more than a decade, and focuses on providing educational materials to scientists and engineers to facilitate the routine use of Green Chemistry principles in the way work is done," explains Dr Peter Dunn, senior research fellow, Pfizer.

The company has also implemented a recognition programme to reward scientists for Green Chemistry achievements. "In the medicinal chemistry environment, we encourage greener solvent and reagent selection. This has resulted in a 99% reduction in our chloroform usage since 2007, and several other equally important reductions," Dunn continues. "In the process chemistry area, solvent reduction goals for all new compounds are set in conjunction with process chemistry leadership and we were delighted to achieve our 2012 reduction goals two years ahead of schedule."

An ongoing process

When it comes to manufacturing, Pfizer's second-generation process chemistry teams are dedicated to delivering new and greener processes, often taking advantage of improvements in biocatalysis. "A striking example of this is the enzymatic process to manufacture pregabalin," Dunn remarks. "We have recently conducted a full 'cradle-to-gate' lifecycle assessment of this process, and have found that, between 2007 and 2020, the new biocatalytic process will eliminate approximately three million tonnes of CO₂ emissions."

A Quality by Design (QbD) approach to drug development and manufacturing is another method for achieving sustainability goals.

“QbD builds quality into manufacturing through process understanding and quality risk management,” explains Carla Wright, director of Pfizer Global Engineering. “Processes developed under the QbD approach can operate across an approved design space, giving manufacturers the flexibility to make the necessary changes to optimise performance and quality. Applying green-focused principles to a QbD approach can drive the minimisation of an environmental footprint.”

Another buzzword in the pharmaceutical industry is PAT, or Process Analytical Technology, which provides in-process measurement of critical attributes, enabling process understanding, process monitoring, real-time release testing and advanced process control (APC) strategies. According to Wright, environmental monitoring, solvent recovery optimisation and (indirect) energy reduction are three examples of PAT’s use in the pharmaceutical industry.

“Detailed process understanding gained through PAT helps identify sources of variability and ways to mitigate them, reducing process deviations, preventing re-processing, rejects and scrap, and improving energy and material use to increase capacity,” she explains. “The combination of PAT and APC provides robustness by automatically controlling process variability settings to achieve target product quality in the most efficient way.”

The way forward

Looking to the future, Pfizer’s Green Buildings Programme will contribute significantly to the company’s continuing commitment to sustainability. “The Green Design element of Pfizer’s Energy & Climate Change Programme has been developed to ensure that new facilities added to Pfizer’s real-estate portfolio are designed and built as ‘high performance’ facilities,” Brown confirms. “This minimises the resources needed to both build and operate the facility over its lifecycle.”

Key principles include careful site selection, capacity planning, incorporating newer and more efficient technologies, selecting materials that can be sustainably sourced, practising sustainable construction processes, and ensuring that building systems are

Case study: Project SPRING

One particular initiative Pfizer implemented, Project SPRING, involved improving the operation cost, performance and sustainability of a 50-year-old building housing offices and laboratories at the company’s site in Freiburg, Germany.

Using innovative, cost-effective ‘green’ building technologies and techniques such as a ventilation process that reduces air flow rates and a geothermal system that uses the natural heat storage capacity of the earth’s thermal mass to provide energy-efficient heating and cooling, the building was transformed into a modern, eco-friendly site.

The initiative saved \$440,000 in annual energy costs, reducing gas and fuel by 3,325MW/h and reducing CO₂ emissions by 1,200 metric tons.

Some of the green innovations included:

- Geothermal energy for cooling and heating — a first for Pfizer Europe. The temperature of the soil 130m below the surface is 12°C year round. This geothermic reservoir is used to store heat in summer and to supply heat in winter; pipes filled with a brine solution bring the energy into the building. Using low-temperature ceiling panels, offices can be heated in winter and cooled in summer.
- Adiabatic cooling — incoming air is sprayed with water vapour. Evaporation of the droplets cools the air, allowing lower temperatures even without air conditioning.
- New windows and innovative open office space — natural illumination is supplied by a two-zone window shade system, optimising daylight to supply light to all areas of the building. Additionally, energy from the sun is minimised by external ‘sun protection’ on the windows.
- Heating energy minimised — heating produced from business equipment was significantly reduced by combining printers, copiers and scanners, using only one refrigerator per floor and minimising the use of individual printers.
- Green technologies in labs — a reduced air flow rate in fume hoods was achieved by installing sensors that automated window shield closure. Closed systems for solvent refilling and waste handling operations were implemented, minimising solvent emissions. The ventilation of laboratories was reduced overnight, so the air exchanged decreased by half.

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fully commissioned. “Collectively adopting these principles will contribute toward creating a facility that has minimal impact on the environment and provides operational cost benefits over the life of the asset,” says Brown.

It seems that not a stone has been left unturned across Pfizer’s sustainability programme. Indeed, Brown aptly concludes: “As a science-based healthcare company, we recognise the of importance environmental stewardship.” ■