Green building: case study of Atkins' engineering sustainable design in Dubai

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Introduction

The field of green technology encompasses a continuously evolving group of methods and materials, from techniques for generating energy to non-toxic cleaning products, driving to a healthy environment and a healthy economy. Green technology seeks to conserve nature and even reverse harm done to it. It includes recycling, water purification, sewage treatment, energy conservation, air pollution control, environmental remediation, green buildings, renewable energy sources such as solar and wind power, and many other technologies – all seems to be focused around … cities.

Indeed, cities are gigantic, being the largest creations of humanity and it is surprising why people have not been drawing the connections between cities and the largest environmental problems we encounter (Green Technology, 2008). In fact, there is an idea out there that only recently is getting through to people worldwide – redesign cities and it can save the earth (*ibidem*). Looking at the data provided in the figure below, an immediate question arises on how will the next generation of technology look like for green cities, encompassing everything from the choice of building materials to where a building is located.

To start discoveries, it might be of some interest to mention here, that for e.g. in the TechNet Recommendations the green technologies include, but are not limited to:

industrial process innovations that enable efficient manufacturing and product distribution;

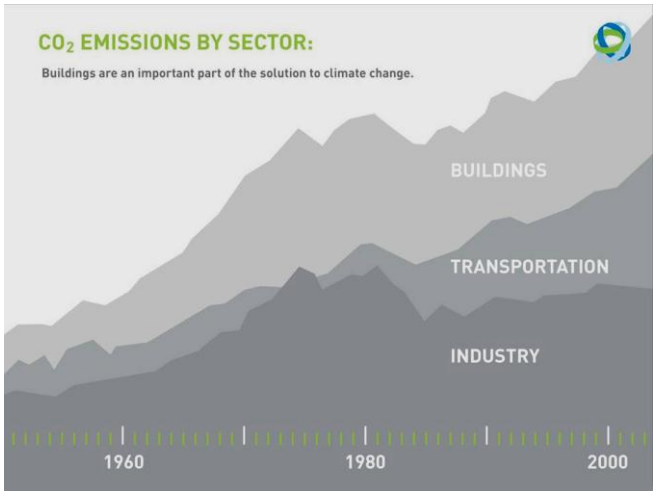
dynamic systems that rely on advanced sensors and networked communications to create highly efficient 'smart' homes and offices;

'intelligrid' systems that increase efficiency and reliability of electricity supply;

time-of-day metering and energy valuation to drive energy efficiency;

low-emittance coatings that enable energy efficient windows and skylights;

energy efficient light-emitting diode lighting.



Source: Smith, R., Abu-Hijleh B. IAMOT 2008 Proceedings.

It is widely-known, that many European cities are already making carbon reduction commitments, and the biggest challenge is to make sure they can do the actual daily carbon footprint measurements with a tracking system. California is leading the American nation in emissions reductions and finding new ways to expand climate change efforts. In particular, California has designed new green building codes to improve energy efficiency, reduce water consumption and lighten the carbon footprint of the local built environment. The novel building code applies to every new structure to be built in California, from hospitals and hotels to homes and schools. Those already familiar with LEED[1] guidelines will find many similarities. Similar efforts are done outside the US and EU. When in 2008 IAMOT[2] for the first time in its history held a conference in the Middle East, the President of IAMOT Professor Tarek Khalil said "There is so much pioneering activity within the Middle East at the present time that it seemed an ideal opportunity to bring the International Conference to Dubai. Technology forms the backbone that

[1] Leadership in Energy and Environmental Design, LEED.
[2] International Association for Management of Technology, IAMOT.

makes many of the region's impressive projects possible, and – through its careful management – organisations in the region are achieving impressive results".
The case study to follow has a two-fold objective: to understand what a green building is and to go for a study outside the EC and US, to the Middle East, and discover what is being done there so far. In particular, we look at the world's 11th largest global design firm – Atkins – focusing on one of its geographical markets in the UAE and its sustainable design projects in Dubai.

Company background

Atkins is the UK's largest engineering consultancy for the last 12 years and the world's 11th largest design firm[3]. The original company, WS Atkins and Partners, was established in 1938 by Sir William Atkins in London. In its early years, the company specialised in civil and structural engineering design. After almost 60 years operating as a private company, Atkins was successfully floated on the London Stock Exchange in 1996. Among multiple contemporary awards, Atkins won Environmental Excellence 2009 Award: Best Environmental Consultancy, Best Consultancy for Contaminated Land and Best Consultancy for EIAs[4] and SIAs (UK); The CIBSE Low Carbon Performance Awards 2010 Winner: Consultancy of the Year.
Atkins' clients range across the public and private sectors. To name just a few, company's customers include: Network Rail, Environment Agency, Transport for London, Airbus, CLP Power Hong Kong Ltd, Rolls Royce, BP, Nakheel, British Energy. To understand breadth and depth of Atkins' technical expertise, services and skills, it will take nearly all letters in ABC, starting from access and inclusive design through multiple environmental assessments to wind energy[5]. The case to follow is focusing on Atkins projects in Dubai – the area that hasn't been widely described in the western literature. The idea behind it is to make a journey into this far-distant corner and to get a glimpse into sustainable innovations developing in the UAE.

Atkins' landmarks in Dubai

The DIFC Lighthouse Tower

The DIFC Lighthouse Tower is a low-carbon, 400m high sustainable development office tower accommodating with 64 office floors and which already gained Holcim Award and Cardiff University Innovation Award. Low Carbon Tower is located at the Dubai International Financial Centre (DIFC) and aims to reduce its Carbon Emissions by up to 65% and use 40% less water.

Atkins was appointed to provide architectural, structural, MEP engineering and sustainable design services for this 400-metre DIFC Lighthouse tower.

DIFC is a 110-acre free zone envisaged to be the world's newest international financial centre serving the vast region between Western Europe and East Asia, and catering for international financial and blue chip organisations from around the world. From the outset, one of the aims of the design has been to make this one of the world's lowest carbon-footprint buildings. The building

[3] Source: http://www.atkinsglobal.com/about_atkins/
[4] Environment Impact Assessment, EIAs
[5] For more please see: http://www.atkinsglobal.com/about_atkins/a_to_z_of_skills_and_services/

will incorporate cutting-edge technology to reduce its energy consumption and offset its carbon emissions. These include:

- extensive solar shading and high performance glazing to reduce cooling loads;
- use of solar collectors to run absorption chillers;
- high efficiency building services, including intelligent lighting controls, daylight dimming, hear recovery and mechanical services selected and seized to run efficiently at both full and part load;
- use of chilled surfaces to provide comfort rather that 100% air systems;
- "regenerative elevators" that generate electricity;
- integration of photovoltaic panels into the building façade to generate up to 14% of the building's power needs.

When compare to a typical Dubai design, this building produces up to 50% less carbon emissions and uses up to 40% less water.

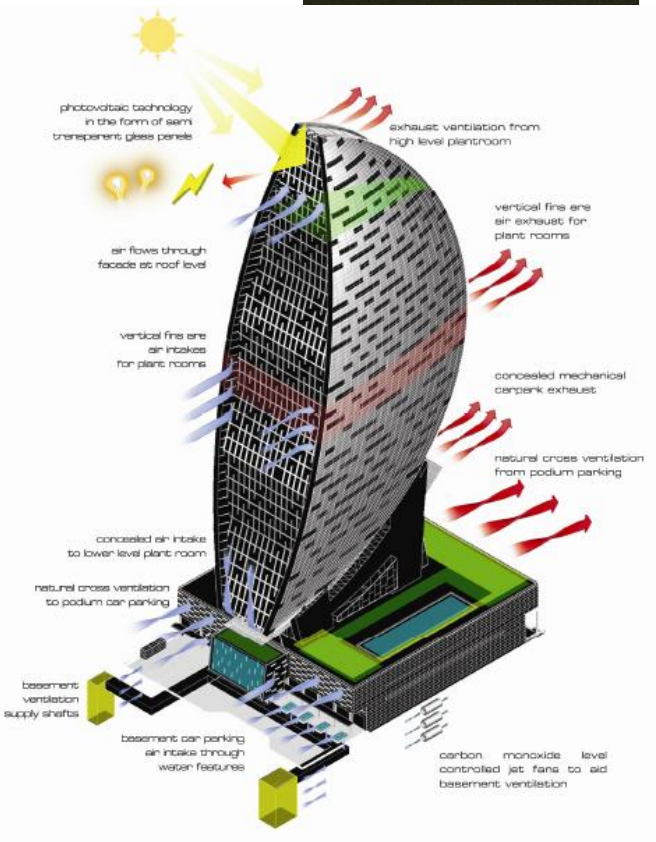
Iris Bay

Iris Bay is a 170m high, 32-storey tower situated on the south-west corner of Dubai's business district near Sheikh Zayed Road. Atkins was commissioned as a lead consultant for architecture, structural, mechanical and electrical engineering design, and construction supervision for the building.

The revolutionary ovoid design was inspired by the client's request for a landmark development that stands out from its neighbouring buildings. Iris Bay succeeds in this objective not by the normal height differentiator, but by its form. The distinctive design comprises two identical double curved pixelated shells which are rotated and cantilevered over the podium. The rear elevation is a continuous vertical curve punctuated by balconies while the front elevation is made up of seven zones of rotated glass.

Two curved 40m structural beams support the tower, perhaps the greatest engineering challenge of the project. During supervision, concrete was poured continuously over 48 hours, in each of the three main sections which make up the beam.

The project, which will incorporate both passive and active environmental features, includes naturally ventilated spaces and integrated solar energy and shading films in the glass façade.



Environmental initiatives include:

- a photovoltaic frit incorporated into the main façade to improve the solar performance of the glass with an option to generate electricity.
- careful design of the microclimate on the top of the podium to ensure comfort for people through shading, planting and use of water features.
- natural ventilation of the car park.
- balconies and extended side elevations provide shadings.

Flagship Campus

Atkins has been commissioned to provide full design services for this prestigious educational facility located in Dubailand. These services include masterplanning, architecture, structural and electro-mechanical engineering, landscaping, quantity surveying, and project management. The development comprises complete educational facilities from crèche to junior college including staff and student accommodation and sports facilities.

The Flagship Campus will be located within the prestigious Dubailand development 30km south of Dubai and will be the first of its kind in the Middle East. The masterplan responds to the location, climate, local culture, local architecture, and creates indoor and outdoor spaces between the schools which are extremely important to the overarching architectural philosophy. The Landscape design divides the campus up into different zones each catering to the various educational levels. Grand avenues of pedestrian walkways will traverse the campus site allowing for safe free flowing travel across the development's grounds, all shaded by a myriad of large canopied trees and palms. Reading niches and educational elements will be interwoven into the public realm landscape at every opportunity. At specific nodal points large structures with digital walls or clock fascias will be placed to be used as a teaching element within the campus grounds.

The Primary and Nursery Clusters which form the Phase 1 of the Taaleem Flagship Campus are nestled around central courtyards that provide a safe environment for the children to learn and play. At every opportunity the classroom activities are allowed and encouraged to spill out into the public realm. Reading niches, exercise equipment, vegetable patches, play zones and educational equipment all abound and are used at every opportunity to constantly engage the children and provide them with as much learning material as possible.

Atkins has also detailed the demand loads for the utility services needed to supply the campus. These cover potable water, foul sewerage, irrigation water and surface water drainage, telecommunications, power supply, LV and TV networks, and district cooling. The total estimated population for the Taaleem Flagship School is 7,063 made up students, staff and residents. The landscaped campus and range of facilities will be a leading educational example to all, and

an exciting centre of excellence for the students and staff alike. It is expected the school will be fully complete and operational by September 2012, and will be the first LEED Silver accredited school in the region.

Everyone is talking about innovation, everyone is talking about sustainability – and rightly so as innovation and sustainability will be major force for both change and growth for business in the future. We are challenged to find ways to balance the needs of planet earth's 7, 8 or even 9 billion people for food, water, energy, security and fulfilment with the fact that we have but one planet. How to employ our limited resources, including the space available to us, to address the challenges of climate change, pollution and social imbalance? As humanity we are facing massive innovation challenges – and opportunities – that will require all of us to reconsider our understanding of products, service, processes, marketing approaches, business models – of innovation itself, and of our way of life. Where to start? Which direction to take? The story described in this case might be one way to start.

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