Energy
Volume 170 Issue EN3
Editorial
Rugumayo

Proceedings of the Institution of Civil Engineers
Energy 170 August 2017 Issue EN3
Pages 91–92 http://dx.doi.org/10.1680/jener.2017.170.3.91

ice | proceedings

ice Institution of Civil Engineers
publishing

Editorial

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Welcome to the third edition of the *Energy* journal this year

The UN Sustainable Development Goal no. 7 (UNDP, 2015) is to: ensure access to affordable, reliable, sustainable and modern energy for all by 2030. This can mean the use of more energy-efficient materials and product technologies. The evolution of the rural cook stove from the three-stone fire to the improved cook stove can be seen as moving from stone to clay and other materials, which retain more heat, and better product design, which allows increased retention of heat energy.

The increased retention of heat energy gives higher efficiency (from 10% to 50%) and means less wood fuel or charcoal (REN21, 2015) is required to providing the same service. Subsequently there will be less demand on forests, reducing deforestation promoting afforestation, which is a desired scenario for sustainable development.

Relevant research into performance of various materials and product technologies provides very useful results for their adoption and subsequent management. This is in consonance with Target 7A of the UN Sustainable Development Goals (UN, 2016: p. 23), which is: 'By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology…'.

We are privileged that in this edition all three papers relate to research on materials, product technologies and their performance or efficiencies.

The first paper (Ralegaonkar *et al*., 2017) is relevant to developing countries, since it is set in India and relates to the urban poor who are a segment of society that is often forgotten, because of the greater interest in the rural poor and the urban rich.

Here the authors compare traditional building materials to alternative construction materials and examine their performance in buildings in controlling the peak cooling load demand. The traditional materials were fly ash bricks for the walls and reinforced cement concrete for the roofs, while the standard government approved plans were for one-, two- and three-storeyed buildings. This information was modelled using the concepts of building information modelling (BIM) in Revit software. The alternative materials were biofuel ash cellular lightweight bricks and expanded polystyrene geofoam as an insulator, with reinforced cement concrete for the roof.

The results showed that the latter combination of alternative materials is energy-efficient, cost-competitive and would conserve peak cooling load as compared to the traditional materials. This result shows the significant scope for research and commercialisation of alternative materials that are more energy-efficient and affordable to the users. Furthermore, it demonstrates how BIM techniques can improve the scope and speed of modelling.

The second paper (Ali *et al*., 2017) is set in northern England, relates to more developed countries and compares the thermal performance of ground source heat pumps (GSHPs) to that of the traditional gas boiler system. GSHPs are one of the four technologies that are listed in the renewable heat incentive (RHI) scheme of 2014 to help homeowners save money by contributing to the country's greenhouse gas emission goals, and a feed-in tariff was provided for renewable energy generation in 2015. GSHPs have been proven to provide clean heating and cooling energy at reasonably high efficiency.

Four newly built identical houses were used for demonstration project. Three had heat pump systems (but with differing heat exchangers and with or without infiltration trenches) and one had a traditional gas boiler.

The results showed the overall consumption of the conventional heating system was almost twice that of the heat pump systems, although operating heat pumps resulted in higher electricity consumption. Carbon dioxide emissions were the same for both systems. While loop design and moisture levels impact on the coefficient of performance levels, the three heat pump systems showed that they can be classified as renewable.

The third paper (Bai *et al.*, 2017), based on research done in China, is relevant to both developing and developed countries. It investigates the performance of renewable energy technologies and specifically the foundations of wind turbines, which are crucial in providing the desired stability necessary for energy generation.

It had been observed worldwide that there was excessive vertical displacement of wind turbines with can foundations. Crack occurrence and propagation are crucial factors that can reduce a turbine's capacity and alter its dynamic response.

Two 1·5 MW turbines were taken as the case study and two approaches were used to determine the nature of defects around the flange.

The results showed that cracks would occur at an early stage, grow gradually and fluctuate according to the wind speed changes. This implies that in order to ensure foundation integrity of wind turbines, long-term monitoring of crack development is required. It further emphasises the need for regular maintenance of all energy technologies in order to sustain their performance and efficiency.

I hope readers will find all the papers interesting and stimulating. Pleasant reading!

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