

IPENZ ENGINEERING UPDATE March 2010



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Samplings from this Issue

- Objectively assessing risk in a complex world.
- The five essential skills for a global marketplace.
- PPPs: The passage of time permits a sober reflection.
- Personalities into teams.
- Estimation of tsunami hazard in New Zealand due to South American earthquakes.
- Improving urban irrigation efficiency by using weather-based "smart" controllers.
- Modification of a conventional anaerobic digester for improving the effluent and sludge characteristics.

SPECIAL FOCUS... COMPRESSED AIR—Part Two Energy storage systems

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Management/Leadership/Strategic Planning/Recruitment/Training and Development/Project Management/Corporate Responsibility



√IPENZ 33/01 Leadership role models earn trust and profits.

Harris, P. T+D, Volume 64 Issue 3 (March 2010) Pages 46-50.

Results of a recent employee survey reveal that over half of respondents report feeling “stagnant” in their jobs while 62 percent do not aspire to taking on leadership roles in their organisations. Development Dimensions International (DDI) found in a research project that confidence in leaders had fallen to a 10-year-low. As well, the disparity between stagnant and contented staff is widening, in a difficult time where employers cannot afford to have unproductive, poorly engaged workers. Other studies also show that disenchantment in the workplace is rampant. Even taking into account how these findings may be affected by the current recession, some experts expect that high levels of dissatisfaction are becoming the norm.

√IPENZ 33/02 Great leaders are readers: Five lifelong learning principles for leaders and new team members.

Pearson, J. Employment Relations Today, Volume 35 Issue 3 (Fall 2008) Pages 1-8.

√IPENZ 33/03 Creating a culture of health: The new corporate mandate.

Knilians, G. Employment Relations Today, Volume 35 Issue 3 (Fall 2008) Pages 35-41.

Creating a culture of health is a new corporate mandate in the US and is reported on in this paper. An April 2008 study revealed that, whereas income increased by just three percent from 2001 to 2005, employee spending on health rose by 30 percent. Indirect consequences of poor health include absenteeism and presenteeism. Key drivers for a “21st Century Intelligent Health System” are patient safety, an improved IT system, a culture and system of quality and personal responsibility for health.

√IPENZ 33/04 Employee maintenance: An effective safety & wellness strategy.

Harris, B. Professional Safety, Volume 55 Issue 2 (February 2010) Pages 54-55.

Employee maintenance and wellness strategy in the United States are examined in this article.

√IPENZ 33/05 Risk informed decision making.

Ayyub, B., Prassinis, P. and Etherton, J. Mechanical Engineering, Volume 132 Issue 1 (January 2010) Pages 28-33.

√IPENZ 33/06 Objectively assessing risk in a complex world.

Lyons, J. Leadership & Management in Engineering, Volume 8 Issue 4 (October 2008) Pages 231-254.

To engineers, risk management tends to mean events directly linked to particular programme elements within the engineering effort. While these risks must be addressed and managed, operating environments that are more and more complex and interdependent also mean that it is no longer possible to assume that events outside the scope of the programme plan are not likely to happen or will only lead to minimal inconvenience. Recent catastrophic events such as ceiling panel collapses in the Boston Big Dig tunnel and levee breaches in New Orleans demonstrate that events outside the control of the designer and contractor can hugely impact the whole infrastructure programme as well as professional reputations in addition to raising questions concerning institutional bias and complacency.

√IPENZ 33/07 The five essential skills for a global marketplace.

Sensenig, K. Employment Relations Today, Volume 36 Issue 1 (Spring2009) Pages 27-33.

According to this article, there are five crucial skills that people need to become more effective in the modern, global business environment. The speed of change and globalization will affect the five skills of rapport building, curiosity, ambition, communication and conflict resolution. The advantages of lifelong and ongoing learning with regard to these five skills are also examined.

**√IPENZ 33/08 The real deal: The truly sustainable project delivers results for the environment, the community and the company.**

Authors:Gale, Sarah Fister

Source:PM Network; Dec2009, Vol. 23 Issue 12, p30-35.

Moves by various companies to adopt sustainability are considered in this paper. Rather than only viewing sustainability in the context of the environment, sustainability also means fitting environmental issues into project decision-making and moreover includes social considerations.

√IPENZ 33/09 The value of project management to organizations in Canada and Germany, or do values add value? Five case studies.

Mengel, T., Cowan-Sahadath, K. and Follert, F. Project Management Journal, Volume 40 Issue 1 (March 2009) Pages 28-41.

By conducting five case studies (four in Canada and one in Germany), the authors sought to better understand the worth of values and meaning when implementing project management. After outlining the particular approach used, the article then discusses the five case studies. The findings are grouped according to concepts of value of project management and meaningful work. The article concludes by summarising the findings across the case studies using comparative content analysis.

√**IPENZ 33/10 Terminal velocity: Under major scrutiny, a project team fights the clock in one of the world's busiest airports.**

Wheatley, M. PM Network, Volume 23 Issue 12 (December 2009) Pages 40-45.

The overhauling of one terminal at Heathrow Airport in London is examined in this article.

√**IPENZ 33/11 Public-private partnerships in the Netherlands: Policy, projects and lessons.**

Klijn, E. Economic Affairs, Volume 29 Issue 1 (March 2009) Pages 26-32.

The re-emergence in the Netherlands of public-private partnerships (PPPs) since the 1980s is investigated in this paper. The policy discussions that have occurred and an analysis of the implemented or planned projects are examined. From the Dutch experience, several policy conclusions can be drawn.

√**IPENZ 33/12 PPPs: The passage of time permits a sober reflection.**

Hodge, G. A. and Greve, C. Economic Affairs, Volume 29 Issue 1 (March 2009) Pages 33-39.

This article contends that so far appraisals of public-private partnerships indicate contradictory results as to effectiveness and value-for-money. As political popularity continues, more attention is required to strengthen future evaluations and to carry these assessments out at a distance from policy supporters.

√**IPENZ 33/13 A methodology for attaining and assessing project success for rehabilitation projects**

Watson, P. Journal of Building Appraisal, Volume 4 Issue 3 (Winter 2009) Pages 181-189.

√**IPENZ 33/14 Roaring out of recession.**

Gulati, R., Nohria, N. and Wohlgezogen, F. Harvard Business Review, Volume 88 Issue 2 (March 2010) Pages 62-69.

The article focuses on strategic planning, corporate survival during slow growth periods, and business conditions during the economic recovery from a U.S. recession that began in 2007. A study on public companies found that 17 percent did not survive a recession because of bankruptcy, acquisition, or privatization. The effectiveness of the defensive and offensive strategies that improved the post-recession performance of nine percent of the research sample are discussed. Data is given which shows the post-recession growth in sales and profits for companies that are categorized as prevention-focused, promotion-focused, pragmatic, or progressive. The ideas of cost reduction, operating efficiency, and investment opportunity are mentioned.

√**IPENZ 33/15 Is 'more training' the solution to human error?**

Resimius, M. and Stiller, J. Plant Engineering, Volume 64 Issue 2 (February 2010) Pages 18-21.

√**IPENZ 33/16 Biological rhythms – How they affect human performance.**

Kulshreshtha, A. K. Chemical Business, Volume 22 Issue 12 (December 2008) Pages 18-20.

√**IPENZ 33/17 Five ways to bungle a job change.**

Groysberg, B. and Abrahams, R. Harvard Business Review, Volume 88 Issue 1 (January/February 2010) Pages 137-140.

The article focuses on career development and job change. The challenges, transaction costs, and risks associated with job moves are discussed. The authors' research with executives is noted. The mistakes in career development that job hunters make are not doing enough research on the job market, leaving a job for one that offers more money, job-hopping instead of career planning, overestimating one's value to an organization, and thinking in a short term perspective. Questions that should be asked throughout the process of a job change are mentioned. The effect of psychological, social, and time pressures on a job move is mentioned.

√**IPENZ 33/18 Slow death by meeting.**

Xavier, S. Employment Relations Today, Volume 35 Issue 3 (Fall 2008) Pages 9-15.

Discusses the impact of poorly organised meetings.

√**IPENZ 33/19 Harnessing your staff's informal networks.**

McDermott, R. and Archibald, D. Harvard Business Review, Volume 88 Issue 2 (March 2010) Pages 82-89.

The article discusses the integration of employees' informal social networks into the organization's formal management practices. The advantages of having communities of practice share information and collaborate on innovation or problem solving are noted. Research that was conducted by Warwick Business School's Knowledge and Innovation Network and financed by Schlumberger company and the Warwick Innovative Manufacturing Research Centre is discussed. The development of global communities of practice at the construction and engineering company Fluor is mentioned. Four principles related to the communities' effectiveness are discussed.

√**IPENZ 33/20 Personalities into teams**

Wilde, D. Engineering, Volume 132 Issue 2 (February 2010) Pages 22-25.

Ways of creating positive energy at work when faced with a serious economic downturn is the focus of this article. Leadership can generate positive and creative energy so that staff can see that they are useful and productive. It is important for higher executives to show that a competent leadership can overcome unstable times. Positive, significant and creative activities are key. As well, the establishment of a forum for honest two-way communication is encouraged.

√**IPENZ 33/21 Whose responsibility is it to keep your work current?**

Garrett, M. Leadership & Management in Engineering, Volume 9 Issue 1 (January 2009) Pages 51-52.

An essay is presented on the responsibility of civil engineers, and as members of American Society of Civil Engineers (ASCE) following the Society's Code of Ethics. It presents the fundamental principles in the code which include the task of the engineers to conform to sustainable development standards, and carry out tasks in areas of specialization. The author also discusses the significance of providing employees with the current copy of standards including the Ten State Standards.

Technical Aspects of Engineering

√IPENZ 33/22 **A framework for reliability-based system assessment based on structural health monitoring.**

Hosser, D., Klinzmann, C. and Schnetgöke, R. Structure & Infrastructure Engineering: Maintenance, Life-Cycle Design & Performance, Volume 4 Issue 4 (August 2008) Pages 271-285.



√IPENZ 33/23 **A multi-objective advanced design methodology of composite beam-to-column joints subjected to seismic and fire loads.**

Pucinotti, R., Ferrario, F. and Bursi, O. S. AIP Conference Proceedings, Volume 1020 Issue 1 (7 August 2008) Pages 1093-1102.

√IPENZ 33/24 **Base isolation for seismic retrofitting of structures.**

Matsagar, V. and Jangid, R. S. Practice Periodical on Structural Design & Construction, Volume 13 Issue 4 (November 2008) Pages 175-185.

√IPENZ 33/25 **Cyclic performance of concrete filled steel tubular columns after exposure to fire: analysis and simplified model.**

Han, L. H., Lin, X. K. and Yang, Y. F. Advances in Structural Engineering, Volume 11 Issue 4 (August 2008) Pages 455-473.

√IPENZ 33/26 **Nondestructive assessment of concrete structures exposed to fire.**

Balaji, K. V. G. D., Raju, S. S. S. V. and Gopala. International Journal of Applied Environmental Sciences, Volume 4 Issue 1 (2009) Pages 25-31.

√IPENZ 33/27 **Dynamic soil-structure interaction of bridge substructure subject to vessel impact.**

McVay, M. et al. Journal of Bridge Engineering, Volume 14 Issue 1 (January/February 2009) Pages 7-16.

√IPENZ 33/28 **Prediction of aging characteristics in natural rubber bearings used in bridges.**

Itoh, Y. and Gu, H. S. Journal of Bridge Engineering, Volume 14 Issue 2 (March/April 2009) Pages 122-128.

√IPENZ 33/29 **Enhanced seismic performance of hybrid bridge systems: Comparison with traditional monolithic solutions.**

Palermo, A. and Pampanin, S. Journal of Earthquake Engineering, Volume 12 Issue 8 (November 2008) Pages 1267-1295.

√**IPENZ 33/30 Impact of climate change on corrosion risks.**

Roberge, P. R. Corrosion Engineering, Science & Technology, Volume 45 Issue 1 (February 2010) Pages 27-33.

√**IPENZ 33/31 Possible effects of climate change on atmospheric corrosion in Australia.**

Cole, I. S. and Paterson, D. A. Corrosion Engineering, Science & Technology, Volume 45 Issue 1 (February 2010) Pages 19-26.

√**IPENZ 33/32 Estimation of tsunami hazard in New Zealand due to South American earthquakes.**

Power, W., Downes, G. and Stirling, M. Pure & Applied Geophysics, Volume 164 Issue 2/3 (February 2007) Pages 547-564.

√**IPENZ 33/33 Global frequency of magnitude 9 earthquakes.**

McCaffrey, R. Geology, Volume 36 Issue 3 (March 2008) Pages 263-266.

√**IPENZ 33/34 Seismic response of liquid storage tanks incorporating soil structure interaction.**

Larkin, T. Journal of Geotechnical & Geoenvironmental Engineering, Volume 134 Issue 12 (December 2008) Pages 1804-1814.



√**IPENZ 33/35 Effect of infiltration and inflow in dry weather on reducing the pollution loading of combined sewer overflows.**

Lee, D. et al. Environmental Engineering Science, Volume 26 Issue 5 (May 2009) Pages 897-906.

√**IPENZ 33/36 Estimating rain derived inflow and infiltration for rainfalls of varying characteristics.**

Zhang, Z. Journal of Hydraulic Engineering, Volume 133 Issue 1 (January 2007) Pages 98-105.

√**IPENZ 33/37 Innovative tracer methods for sewer infiltration monitoring.**

Kracht, O., Gresch, M. and Gujer, W. Urban Water Journal, Volume 5 Issue 3 (July 2008) Pages 173-185.

√**IPENZ 33/38 One-pipe geothermal design: Simplified GCHP system.**

Mescher, K. ASHRAE Journal, Volume 51 Issue 10 (October 2009) Pages 24-26,28,30,32,34,36,38,40.

√**IPENZ 33/39 Adsorption and removal kinetics of phosphonate from water using natural adsorbents.**

Anil Kumar, A. R. et al. Water Environment Research, Volume 82 Issue 1 (January 2010) Pages 62-68.

√IPENZ 33/40 **Modification of a conventional anaerobic digester for improving the effluent and sludge characteristics.**

Uludag-Demirer, S., Demirer, G. N. and Othman, M. Water Environment Research, Volume 81 Issue 12 (December 2009) Pages 2447-2454.

√IPENZ 33/41 **Evaluation of landfill gas decay constant for municipal solid waste landfills operated as bioreactors.**

Tolaymat, T. M. et al. Journal of the Air & Waste Management Association, Volume 60 Issue 1 (January 2010) Pages 91-97.

√IPENZ 33/42 **Environmental and economical acceptance of polyvinyl chloride (PVC) coating agents.**

Bidoki, M. and Wittlinger, R. Journal of Cleaner Production, Volume 18 Issue 3 (February 2010) Pages 219-225.

√IPENZ 33/43 **Improving urban irrigation efficiency by using weather-based "smart" controllers**

Mayer, P and Deoreo, W. American Water Works Association. Journal, Volume 102 issue 2 (February 2010) Pages 86-



√IPENZ 33/44 **Coupled modelling of subsurface water flux for an integrated flood risk management.**

Sommer, T. et al. Natural Hazards & Earth System Sciences, Volume 9 Issue 4, (2009) Pages 1277-1290.

√IPENZ 33/45 **Reclamation of a slurry pond in Singapore.**

Chu, J., Bo, M. and Arulrajah, A. Proceedings of the ICE – Geotechnical Engineering, Volume 162 Issue GE1 (February 2009) Pages 13-20.

√IPENZ 33/46 **De-carbonizing electricity generation: It won't be easy, cheap, nor enough.**

Sioshansi, F. Utilities Policy, Volume 17 Issues 3-4 (September-December 2009) Pages 217-224.

√IPENZ 33/47 **Cost analysis of impacts of climate change on regional air quality.**

Kuo-Jen Liao. Journal of the Air & Waste Management Association, Volume 60 Issue 2 (February 2010) Pages 195-203.

√IPENZ 33/48 **In-vehicle exposures to particulate matter and black carbon.**

Lee, K., Sohn, H. and Putti, K. Journal of the Air & Waste Management Association, Volume 60 Issue 2 (February 2010) Pages 130-136.

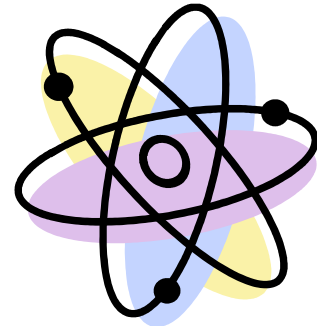
√IPENZ 33/49 **Evaluating water resource management in the face of a carbon market**
Lellou, B and Strassberg, V. American Water Works Association. Journal, Volume 102 Issue 2
(February 2010) Pages 74-

√IPENZ 33/50 **Predicting peaks in power demand.**
Loucks, D. Plant Engineering, Volume 64 Issue 1 (January 2010) Pages A12-A13.

√IPENZ 33/51 **Manage energy, accountability with automation integration.**
Konerman, R. Plant Engineering, Volume 63 Issue 11 (November 2009) Pages 15-21.

√IPENZ 33/52 **Carbon super-springs.**
Livermore, C. Mechanical Engineering, Volume 132 Issue 3 (March 2010) Pages 30-35
Carbon nanotubes have the potential to store a thousand times more mechanical energy, pound for pound, than steel springs.

Focus on... Compressed Air : Part Two. Energy Storage



√IPENZ 33/53 **Parking the power: Strategies and physical limitations for bulk energy storage in supply-demand matching on a grid whose input power is provided by intermittent sources.**
Pickard, W. F., Shen, A. Q. and Hansing, N. J. Renewable and Sustainable Energy Reviews (Article in Press).

It is shown that, in a sustainable energy future, energy for the electricity grid will probably be derived largely from the renewable sources of wind and solar radiation. Because both are intermittent, any infinite busbar grid supplying a metropolitan area must necessarily be buffered from these intermittencies by massive energy storage on the gigawatt-day level. It is then demonstrated that, under presently foreseeable scientific capabilities, only underground pumped hydro and advanced adiabatic compressed air energy storage appear capable of meeting anticipated technological and economic constraints. Neither has ever been constructed and tested; but even so it is predicted that underground pumped hydro ultimately will prove to be superior.

√IPENZ 33/54 **Economic evaluation of the dual mode CAES solution for increased wind energy contribution in autonomous island networks.**
Zafirakis, D. and Kaldellis, J. K. Energy Policy, Volume 37 Issue 5 (2009) Pages 1958-

√IPENZ 33/55 **Full charge ahead [compressed air energy storage].**
Crampsie, S. Engineering & Technology, Volume 4 Issue 6 (4 November 2009) Pages 52-55.

√IPENZ 33/56 **Air compressed with wind power to provide energy in Iowa .**
Fortner, B. Civil Engineering, Volume 78 Issue 1 (January 2008) Pages 34-35.
The article presents information on the Iowa Stored Energy Park (ISEP).

√IPENZ 33/57 **Energy storage systems – Characteristics and comparisons.**
Ibrahim, H., Ilinca, A. and Perron, J. *Renewable and Sustainable Energy Reviews*, Volume 12 Issue 5 (June 2008) Pages 1221-1250.

Electricity generated from renewable sources, which has shown remarkable growth worldwide, can rarely provide immediate response to demand as these sources do not deliver a regular supply easily adjustable to consumption needs. Thus, the growth of this decentralized production means greater network load stability problems and requires energy storage, generally using lead batteries, as a potential solution. However, lead batteries cannot withstand high cycling rates, nor can they store large amounts of energy in a small volume. That is why other types of storage technologies are being developed and implemented. This has led to the emergence of storage as a crucial element in the management of energy from renewable sources, allowing energy to be released into the grid during peak hours when it is more valuable.

The work described in this paper highlights the need to store energy in order to strengthen power networks and maintain load levels. There are various types of storage methods, some of which are already in use, while others are still in development. We have taken a look at the main characteristics of the different electricity storage techniques and their field of application (permanent or portable, long- or short-term storage, maximum power required, etc.). These characteristics will serve to make comparisons in order to determine the most appropriate technique for each type of application.

√IPENZ 33/58 **Enabling technologies for industrial energy demand management.**
Dyer, C. H. *Energy Policy*, Volume 36 Issue 12 (December 2008) Pages 4434-4443.

This state-of-science review sets out to provide an indicative assessment of enabling technologies for reducing UK industrial energy demand and carbon emissions to 2050. In the short term, i.e. the period that will rely on current or existing technologies, the road map and priorities are clear. A variety of available technologies will lead to energy demand reduction in industrial processes, boiler operation, compressed air usage, electric motor efficiency, heating and lighting, and ancillary uses such as transport.

√IPENZ 33/59 **Modeling the benefits of storage technologies to wind power.**
Sullivan, P., Short, W. and Blair, N. *Wind Engineering*, Volume 32 Issue 6 (November 2008) Pages 603-615.

√IPENZ 33/60 **New technology and possible advances in energy storage.**
Baker, J. *Energy Policy*, Volume 36 Issue 12 December 2008), Pages 4368-4373.

√IPENZ 33/61 **Concepts for the improved integration of wind power into the German interconnected system.**

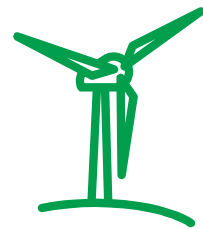
Siemes, P. et al. *IET Renewable Power Generation*, Volume 2 Issue 1 (March 2008) Pages 26-33.

√IPENZ 33/62 **The value of compressed air energy storage with wind in transmission-constrained electric power systems.**

Denholm, P. and Sioshansi, R. Energy Policy, Volume 37 Issue 8 (August 2009) Pages 3149-3158. In this work, we examine the potential advantages of co-locating wind and energy storage to increase transmission utilization and decrease transmission costs. Co-location of wind and storage decreases transmission requirements, but also decreases the economic value of energy storage compared to locating energy storage at the load. This represents a tradeoff which we examine to estimate the transmission costs required to justify moving storage from load-sited to wind-sited in three different locations in the United States.

√IPENZ 33/63 **Integration of large-scale wind power and use of energy storage in the Netherlands' electricity supply.**

Ummels, B. C., Pelgrum, E. and Kling, W. L. IET Renewable Power Generation, Volume 2 Issue 1 (March 2008) Pages 34-46.



√IPENZ 33/64 **Intermittent wind: Problems and a possible solution.**

Blankinship, S. Power Engineering, Volume 112 Issue 6 (June 2008) Pages 52-60.

Use of compressed stored underground during off peak periods.

√IPENZ 33/65 **New demand for energy storage.**

Rastler, D. Electric Perspectives, Volume 33 Issue 5 (September/October 2008) Pages 30-36,39-40,42,44,46-47.

Reviews various energy storage options and suggest cost-effective technologies will be essential for the future.

√IPENZ 33/66 **Baseload wind energy: Modeling the competition between gas turbines and compressed air energy storage for supplemental generation.**

Greenblatt, J. B. Energy Policy, Volume 35 Issue 3 (March 2007) Pages 1474-1492.

√IPENZ 33/67 **Optimal daily operation of electric power systems with an ACC-CAES generating system.**

Yoshimoto, K. and Nanahara, T. Electrical Engineering in Japan, Volume 152 Issue 1 (15 July 2005) Pages 15-23.

The newly developed ACC-CAES generating system, which integrates ACC (Advanced Combined Cycle) technology with conventional CAES (Compressed Air Energy Storage), potentially outperforms other energy storage due to its high efficiency and high capacity factor. Nevertheless, its unusual operation characteristics prevent its benefits from being completely revealed. This means operation patterns of the ACC-CAES and how it contributes to economic operation of a power system need to be examined. An optimal daily scheduling method of a power system with both ACC-CAES generating systems and pumped hydro storage are developed in this paper.

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