

IPENZ ENGINEERING UPDATE June 2009



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- Radar-based flood forecasting for river catchments.
- Methodology for calculating a pipeline repair cost.

► Special Focus : Energy from Waste-Gasification of Municipal Solid Waste

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

√IPENZ 25/01 Increasing VFM in PPP power station projects - Case study: Rudeshur gas turbine power station.

Sobhiyah, M., Bemanian, M and Kashtiban, Y. International Journal of Project Management, Volume 27, Issue 5 (July 2009) Pages 512-521.

In the past, public sector most often invested in power station projects, however, rapid increases in electricity demand, especially in developing countries, and limited financial resources of governments have recently led them to resort to private sector investment. Furthermore, increasing Value for Money (VFM) of the output/service through using the advantages of private sector efficiency is highly sought. To achieve these objectives, long-term partnership between the public and the private sector entities through Public Private Partnership (PPP) agreements are used. In the ideal PPP, risks should be allocated to the party who is the best entity to manage them in the most cost-effective way.

√IPENZ 25/02 The global risk factor.

Wheatley, M. PM Network, Volume 23 Issue 4 (April 2009) Pages 32-39.

The article analyzes the global risk factor of outsourcing parts of projects to overseas partners. Outsourcing some parts of a project to skilled partners in lower-cost economies helps project dollars go further, however, it also possesses conventional risks like poor quality control and poor project governance. To avoid the global risk factors of outsourcing, project managers should find new ways to mitigate the risks.

√IPENZ 25/03 Managing face-to-face international negotiations.

Graham, J. and Hernandez Requejo, W. Organizational Dynamics, Volume 38 Issue 2 (April-June 2009) Pages 167-177.

The article looks at roles and the exchange of information in international negotiations, as well as persuasion, concessions and agreement. In addition, the authors note that getting to yes is not enough in such negotiations.



√IPENZ 25/04 How to be a GOOD BOSS in a bad economy.

Sutton, R. Harvard Business Review, Volume 87 Issue 6 (June 2009) Pages 42-50.

Even in times of economic growth, it's challenging to be a good boss. Research shows that people placed in positions of authority often become less mindful of others' feelings and needs. Meanwhile, those in subordinate roles devote immense energy to watching and interpreting the actions of leaders. These tendencies make for a toxic tandem, which is only exacerbated during a crisis. Sutton, a Stanford professor, provides a useful framework to get bosses focused on what their people need from them most. In a situation where people feel threatened, a good boss finds ways to provide more predictability, understanding, control, and compassion.

√IPENZ 25/05 **The interpersonal side of taking charge.**

Manzoni, JF and Barsoux, J. Organizational Dynamics, Volume 38 Issue 2 (April-June 2009) Pages 106-116.

Starting a new job can cause great stress. This article looks at the pitfalls that may await incoming managers as they try to set up productive relationships with those around them.

√IPENZ 25/06 **Economic internal rate of return (EIRR) estimation in Vietnam hydro power project.**

Kai, L and Tiong, R. AACE International Transactions (2008) Pages IN11-IN16.

√IPENZ 25/07 **Methodology for calculating a pipeline repair cost.**

Vianna, J and Teles, C. AACE International Transactions (2008) Pages ES111-ES119.

√IPENZ 25/08 **Rethinking trust.**

Kramer, R. Harvard Business Review, Volume 87 Issue 6 (June 2009) Pages 68-77.

Will we ever learn? We'd barely recovered from Enron and WorldCom before we faced the subprime mortgage meltdown and more scandals that shook our trust in businesspeople. Which raises the question: Do we trust too much? In this article, Stanford professor and social psychologist Kramer explores the reasons we trust so easily – and, often, so unwisely.

√IPENZ 25/09 **Executing strategic change: Understanding the critical management elements that lead to success.**

Franken, A., Edwards, C. and Lambert, R. California Management Review, Volume 51 Issue 3 (Spring 2009) Pages 49-73.

Strategic change in business and management is the topic of this article. It also offers approaches to executives and managers who are attempting to execute strategies concerning corporate culture, communication, benefits and solutions. The article considers such obstacles to this execution as pressure from shareholders, complexity in organizations, balancing demands, low levels of involvement and resource availability. There is also information on resource allocation, conflict resolution and leadership teams.

√IPENZ 25/10 **The Role of collaboration in achieving corporate social responsibility objectives.**

Pelozo, J. and Falkenberg, L. California Management Review, Volume 51 Issue 3 (Spring 2009) Pages 95-113.

This article examines the achievement of social responsibility objectives through collaboration. When involvement is integrative, rather than only transactional or philanthropic, business goals concerned with social and environmental challenges can be reached. Collaborations between non-governmental organisations (NGOs) and firms are discussed, highlighting how their structures must match with objectives and collection action. There is also information on social welfare, corporate stakeholders, and business management.

√IPENZ 25/11 The Prediction lover's handbook.

Davenport, T and Harris, J. MIT Sloan Management Review, Volume 50 Issue 2 (Winter 2009) Pages 32-35.

Executives are faced with a wide range of options when it comes to picking assessment tools to promote better decisions about future paths. Some of these options are well established while others are in the early stages of being developed. This article provides an insider's guide to prediction and recommendation techniques and technologies. Prediction tools such as biological responses analysis, collaborative filtering and social network-based recommendations are covered. For each tool, the technique, who uses it and why, its strengths, weaknesses and future prospects are briefly described. When in the decision process to start using the tool is also covered.

√IPENZ 25/12 How 'Who You Know' affects what you decide.

Cross, R., Thomas, R and Light, D. MIT Sloan Management Review, Volume 50 Issue 2 (Winter 2009) Pages 35-42.

Little work has been done on how informal networks influence the framing and execution of decisions. The authors investigate the roles decision networks play, not only within teams but throughout organisations. Company leaders often fail to leverage the importance of such decision networks and tend to focus on the organisation's formal structure. Two in-depth case studies are presented to show the application of decision-making interactions inside organisations to facilitate the effectiveness and efficiency of decision-making. For both situations, the benefits of viewing decisions through a network perspective are highlighted. Even at this early stage, it appears useful to understand how decision-making networks affect the top team. As the number of collaborations needed to execute decisions at key points in the network was reduced, there was a positive outcome in terms of company performance and morale.

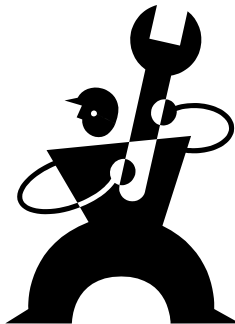
√IPENZ 25/13 Technological breakthroughs and asset replacement.

Yatsenko, Y. and Hritonenko, N. Engineering Economist, Volume 54 Issue 2 (2009) Pages 81-100.

In this paper the optimal replacement of a single asset under continuous and discontinuous technological change is analysed. The authors consider an infinite-horizon replacement problem with a variable asset lifetime. As a result of deterioration, maintenance costs increase with the aging of the asset. Due to technological change, both maintenance and new capital costs decrease in time for a fixed asset age. Single and several technological breakthroughs are taken into account.

√IPENZ 25/14 Developing a maintenance strategy and setting performance targets.

Mills, S. Asset Management and Maintenance Journal, Volume 22 Issue 1 (February 2009) Pages 12-19.



√IPENZ 25/15 6 steps to (re)building a top management team.

Miles, S. and Bennett, N. MIT Sloan Management Review, Volume 50 Issue 1 (Fall 2008) Pages 60-64.

Guidelines for building an effective management team following a merger are presented. The combined firm needs to act quickly to eliminate any ambiguity as key executives who are unsure of their new roles may decide to leave. Surprises can be avoided by conducting adequate due diligence about essential personnel before the merger. The ideas and suggestions of staff of the acquired firm should be respected. Conflicts are inevitable and these must be handled constructively.

Technical Aspects of Engineering

√IPENZ 25/16 Climate policy impacts on the competitiveness of energy-intensive manufacturing sectors,

Bassi, A., Yudken, J and Matthias, Energy Policy, Volume 37, Issue 8, August 2009, Pages 3052-3060.

**√IPENZ 25/17 Ventilation and IAQ with total enthalpy ERV fixed plate heat exchangers.**

Hutson, P. IRHACE (January/February 2009) Pages 8-13.

“With the cost of energy going up all the time building systems that do more with less energy are increasingly recognised not only as sound design and good business sense but are an ethical priority.”

√IPENZ 25/18 The theory behind heat transfer: plate heat exchangers.

IRHACE (January/February 2009) Pages 14-18.

√IPENZ 25/19 Power plant : from water guzzler to water producer.

De Vos, F., Heijboer, R and von Deelen-Bremer, H. Power Engineering International (December 2008) Pages 26-28.

A power plant that does not need a supply of expensive potable water could soon be a reality.

√IPENZ 25/20 Reclaimed cooling water’s impact on surface condensers and heat exchangers.

Schumerth, D. Power, Volume 151 Issue 3 (March 2007) Pages 28-34.

Because water is more precious than power in many regions of the U.S. plant designers are more frequently specifying the use of treated wastewater for plant cooling. Using “gray water” poses its own challenges for critical service equipment like condensers and heat exchangers.

√IPENZ 25/21 Slow progress of FasTrak: usage analysis of an electronic toll collection system.

Bedolla, S., Sengupta, S and Bollapragada, R. Transportation Journal, Volume 46 Issue 1 (Winter 2007) Pages 51-61.

√IPENZ 25/22 **Car free development through UK community travel plans.**

Morris, D et al. Proceedings of the Institution of Civil Engineers : Urban Design and Planning, Volume 162 Issue DP1 (March 2009) Pages 19-27.

√IPENZ 25/23 **Costly myths: An analysis of idling beliefs and behavior in personal motor vehicles,**
Amanda R and Carrico, A. Energy Policy, Volume 37, Issue 8 (August 2009) Pages 2881-2888.

√IPENZ 25/24 **Modeling of hydrogen sulfide oxidation in concrete corrosion products from sewer pipes.**

Jensen, H et al. Water Environment Research, Volume 81 Issue 4 (April 2009) Pages 365-373.

√IPENZ 25/25 **Concrete grandstands : Part 1 : experimental investigation.**

Karadelis, J. Proceedings of the Institution of Civil Engineers : Engineering and Computational Mechanics, Volume 162 issue EM1 (March 2009) Pages 3-9.

√IPENZ 25/26 **Concrete grandstands : Part 2 : numerical modelling..**

Karadelis, J. Proceedings of the Institution of Civil Engineers : Engineering and Computational Mechanics, Volume 162 issue EM1 (March 2009) Pages 11-21.

√IPENZ 25/27 **Catenary action in steel-framed buildings.**

Byfield, M and Paramasivam, S. Proceedings of the Institution of Civil Engineers : Structures and Buildings, Volume 160 Issue SB5 (October 2007) Pages 247-257.

√IPENZ 25/28 **Wind-generated interaction between tall buildings.**

Kim, Y., You, K and Ko, H. Proceedings of the Institution of Civil Engineers : Structures and Buildings, Volume 160 Issue SB5 (October 2007) Pages 295-303.

√IPENZ 25/29 **Plastic bending of sheet steel piles.**

Bourne-Webb, P., Potts, D and Rowbottom, D. Proceedings of the Institution of Civil Engineers : Geotechnical Engineering, Volume 160 Issue GE3 (July 2007) Pages 129-140.

√IPENZ 25/30 **Using a virtual back wall in retaining wall design**

O'Sullivan, C and Creed, M. . Proceedings of the Institution of Civil Engineers : Geotechnical Engineering, Volume 160 Issue GE3 (July 2007) Pages 147-151.



√IPENZ 25/31 **Large breakwaters in deep water in northern Spain.**

Guillen, P. Proceedings of the Institution of Civil Engineers : Maritime Engineering, Volume 161 Issue MA4 (December 2008) Pages 175-186.

√IPENZ 25/32 **Numerical study of scour around a pipeline bundle.**

Liang, D. and Cheng, L. Proceedings of the Institution of Civil Engineers : Maritime Engineering, Volume 161 Issue MA2 (June 2008) Pages 89-95.

√IPENZ 25/33 **Briefing: proactive risk management of urban water supply systems.**

Cunha, M. Proceedings of the Institution of Civil Engineers Urban Design and Planning, Volume 162 Issue DP1 (March 2009) Pages 3-6.

√IPENZ 25/34 **Wavelet decomposition-based approach for fast damage detection of civil structures.**

Mizuno, Yusuke Monroig, Evan Fujino, Yozo. Journal of Infrastructure Systems, Volume 14 Issue 1 (March 2008) Pages 27-32.

√IPENZ 25/35 **Use of low quality water: an integrated approach to urban stormwater management (USM) in the Greater Metropolitan Region of Sydney (GMRS).**

Xiaojiang Yu. International Journal of Environmental Studies, Vol. 65 Issue 1 (February 2008) Pages 119-137.

√IPENZ 25/36 **Drivers and barriers to water transfer in a New Zealand irrigation scheme.**

Lange, M., Winstanley, A and Wood, D. Journal of Environmental Planning & Management, Volume 51 Issue 3 (May 2008) Pages 381-397.

√IPENZ 25/37 **Radar-based flood forecasting for river catchments.**

Reichel, F et al. Proceedings of the Institution of Civil Engineers Water Management, Volume 162 Issue WM2 (April 2009) Pages 159-168.

√IPENZ 25/38 **On quality indicators for radar-based river flow forecasts.**

Collier, C. Proceedings of the Institution of Civil Engineers Water Management, Volume 162 Issue WM2 (April 2009) Pages 115-123.

√IPENZ 25/39 **Corrosion of materials used in the solar energy industry.**

Anti - Corrosion Methods and Materials, Volume 55 Issue 3 (2008) Pages 150-155.

√IPENZ 25/40 **Combined hydro-wind generation bids in a pool-based electricity market.**

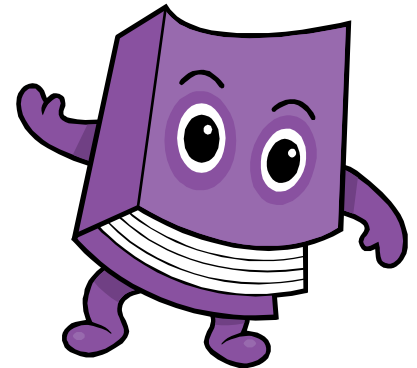
Angarita, J., Usaola, J and Martinez-Crespo, J. Electric Power Systems Research, Volume 79, Issue 7 (July 2009) Pages 1038-1046.

√IPENZ 25/41 **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 2008) Pages 3149-3158.

Books and Standards in Energy Library

These can be borrowed directly by Energy Library members or via interlibrary loan by non members.



√IPENZ 25/42 **Driving down cost: How to manage and cut costs intelligently.** Wilenman, Andrew. London: Nicholas Brealey Publishing, 2008 This is a timely, well structured book of great relevance to both private-sector businesses and public sector organizations. It provides practical techniques for implementing cost reduction programs and useful international case studies.

√IPENZ 25/43 **Scenario planning: the link between future and strategy.** M. Lindgren and H. Bandhold. New York: Palgrave Macmillan, 2003 "Recent research in the field of business strategy has shown that strategic flexibility can be achieved through a scenario planning perspective for long-term competition and performance. The authors have drawn upon examples and case studies to develop a new model for scenario planning that is closely integrated with strategy. They argue that the concept of scenario planning is as much an art as a practical management tool."--Book jacket.

√IPENZ 25/44 **Developing knowledge-based client relationships.** R. Dawson. 2nd ed. Amsterdam: Elsevier, 2005 This book "shows organizations how to lead their key clients into lasting, profitable, high-value relationships. Building on the principles of knowledge-based client relationships, Ross Dawson provides clear and practical approaches for all professional and knowledge-based firms on how to create unique value for both clients and themselves. Detailed case studies across a wide variety of professional services industries offer insights into world-leading practice in the field."--Book jacket.

√IPENZ 25/45 **Change management masterclass: a step by step guide to successful change management.** M. Green. London: Kogan Page, 2007 This book examines the change process in a logical and structured way. The international case studies used indicate that there isn't just one approach to managing change successfully.

√IPENZ 25/46 **Financial information analysis.** P. O'Regan. 2nd ed. Chichester, England: Wiley, 2006 In this book, the author addresses the nature and role of accounting information in modern society, and especially the company annual report. Key issues are illustrated through references to the Tesco annual report, which is included in full as an appendix. There are many case studies and extracts from journals etc.

√IPENZ 25/47 **Accounting for non-accountants: A manual for managers and students.** M. Graham. 7th ed. London: Kogan Page, 2008

This updated edition includes information on the latest accounting and business and financial techniques.

√IPENZ 25/48 **A guide to the project management body of knowledge.** 3rd ed. Newton Square: Project Management Institute (PMI), 2004 This book covers: The project management framework; Project life cycle and organization; The standard for project management of a project; Project management processes for a project; The project management knowledge areas; Project integration management; Project scope management; Project time management; Project cost management; Project quality management; Project human resource management; Project communications management; Project risk management; Project procurement management.

√IPENZ 25/49 **Deploying renewables: Principles for effective policies.** S. Olz. Paris: OECD/IEA, 2008 Provides comprehensive data and information relating to renewable energy markets and policies over the period 2000-2005. Examines the key factors that will determine the success of renewable energy policies and how current policies can be improved to encourage greater deployment of renewables.

√IPENZ 25/50 **The behaviour of reactive power marginal prices in an electricity spot market.** Andrew Graeme Ward. Christchurch: University of Canterbury, 1999 This thesis investigates the behaviour of marginal prices for reactive power in a competitive electricity spot market. In the proposed spot market, non-zero unit costs are assigned to the generation of reactive power as a method of paying for reactive power ancillary services. These costs enable reactive power to be optimally dispatched in the same manner as real power. This is unlike previous research, which has only described the behaviour of reactive power marginal prices in spot markets where the unit generation costs of reactive power equal zero.

√IPENZ 25/51 **Recent developments in management strategies of electric power companies in Europe.** Yajima, Masayuki and others. Tokyo: Central Research Institute of Electric Power Industry, 2008

√IPENZ 25/52 **AS/NZS 1680.1: 2006. Interior and workplace lighting - General principles and recommendations** [Revised edition]

√IPENZ 25/53 **AS/NZS 1680.2.1: 2008. Interior and workplace lighting - Specific applications - Circulation spaces and other general areas.**

√IPENZ 25/54 **AS/NZS 1715: 2009. Selection, use and maintenance of respiratory protective equipment.**

√IPENZ 25/55 AS/NZS 4234: 2008. Heated water systems: calculation of energy consumption.

√IPENZ 25/56 ANSI C12.1: 2008. American National Standards for electric meters: code for electricity metering.

Special focus topic Energy-from-waste— Gasification of municipal solid waste

√IPENZ 25/57 From waste solids to fuel.

Young, G. Pollution Engineering (February 2008) Pages 45-49.

“A look at the economics of a plasma arc gasification technology to produce energy and liquid fuels from a municipal solid waste facility suggests a potential for wide-scale energy savings.”



√IPENZ 25/58 Gasification characteristics of MSW and an ANN prediction model.

Xiao, G et al. (2009) Waste Management, Volume 29 Issue 1 (2009) Pages 240-244.

√IPENZ 25/59 Decision support systems based on the life cycle inventory for municipal solid waste management under uncertainty.

Bieda, B and Tadeuiewicz, R. International Transactions in Operational Research, Volume 15 (2008) Pages 103-119.

This paper reports on the use of Life Cycle Inventory (LCI) to assess two scenarios for waste to energy gasification plants including a 15-year income statement projection. One plant is based on American technology (design at 200 T/D) and the other on Australian (design at 240 T/D). Stochastic modelling, based on the internal rate of return (IRR) and net present value (NPV) values of the new and actual equipment, is used. Scenarios were developed for uncertainty inputs utilising the Monte Carlo simulation with Excel spreadsheet and Crystal Ball software. Charts for sensitivity analysis and frequency represent the Crystal Ball output and simulation results.

√IPENZ 25/60 Gasification of refuse derived fuel in a fixed bed reactor for syngas production.

Dalai, A et al. Waste Management, Volume 29, Issue 1 (January 2009) Pages 252-258.

√IPENZ 25/61 An industry blowing smoke: 10 reasons why gasification, pyrolysis and plasma interaction are not green solutions. GAIA, 2009.

This recent report from the Global Alliance for Incinerator Alternatives raises the following points concerning “staged incineration”: it is harmful to public health; regulations do not ensure safety; its track record of malfunctions, explosions and shut-downs; its non-compatibility with waste prevention, reuse, recycling and composting; it is expensive and financially risky; waste-to-energy is a waste of energy; damage to the natural environment; contribution to climate change; large investment required but few jobs created; incineration is avoidable and unnecessary.

√IPENZ 25/62 Thermal waste treatment for sustainable energy.

Ryu, C., Sharifi, V and , Swithenbank, J. Proceedings of the Institution of Civil Engineers: Engineering Sustainability, Volume 160 Issue 3 (September 2007) Pages 133-140.

To ensure the future sustainability of cities, key problems such as waste disposal , energy production and pollution minimisation must be addressed. As resources are finite and population growing, developed societies are looking at the way energy and materials are consumed and waste is disposed. The current UK practices of segregation and treatment of municipal solid waste (MSW) are reviewed in this paper, with particular consideration of advanced thermal treatment technologies. Segregation of MSW takes place at source or at dedicated facilities around the UK and the residues can be thermally treated to recover energy. Currently the main method utilised by the energy from waste (EfW) industry is direct incineration of unsorted waste. Wastes with a wide range of calorific values can typically be incinerated without any waste pre-processing. Nevertheless, the low energy efficiency and unfavourable public opinion are problematic for such incineration systems. In response, there has been further development of gas clean-up technologies linked with waste incinerators, especially for dioxin removal and fly ash treatment. There are two main alternative processes to incineration: gasification of pre-processed waste and production of solid recovered fuel (SRF) from mechanical and biological treatment (MBT). Both have potentially higher energy efficiencies and are more flexible in their use of primary products. To compete with incineration, further technology developments in conjunction with regulatory drivers are needed. In addition, pyrolysis, producing cheap and storable fuel products, is also available, but only suitable for specific types of waste material. A good quality char can be produced by pyrolysis of waste wood, which can easily be burned in coal-fired power plants or other higher energy efficiency thermal systems.

√IPENZ 25/63 Study on pyrolysis and gasification of wood in MSW.

Ni Ming-jiang Journal of Environmental Sciences, Volume 18 Issue 2 (March 2006) Pages 407-415.

√IPENZ 25/64 Is gasification of solid waste the perfect hedge?

Davis, W. Natural Gas & Electricity, Volume 23 Issue 4 (November 2006) Pages 12-16.

The focus of this article is on the potential for a growth-oriented interdependence between the solid waste industry and the electricity generation markets. The reasons for collaboration, including fuel stability, carbon offsets and renewable energy credits, are explored.

√IPENZ 25/65 Gasification: an alternative process for energy recovery and disposal of municipal solid wastes.

Thesis M.S. in Earth Resources Engineering. Klein, A. Columbia University, 2002. The purpose of the study was to evaluate municipal solid waste (MSW) gasification technology in terms of being an alternative to combustion and also to investigate its potential role in a zero-emission waste-to-energy (ZEWTW) process. Two gasification plants that use unique gas cleaning and gasification technologies so as to produce a synthesis gas that can be utilized as fuel in a combined cycle turbine are compared. The paper also looks at hydrogasification. It concludes that waste gasification is an acceptable alternative but that there is a need to improve operating conditions and gas cleaning technologies.

√IPENZ 25/66 A new gasification and melting incineration process of MSW with co-current shaft furnace

Zhao, W. Journal of Environmental Sciences, Volume 21, Supplement 1, 2009, Pages S108-S111.

IPENZ 25/67 Life cycle evaluation and economic considerations of the pyrolysis-gasification of municipal solid waste in Singapore.

Khoo, H.H., Tan, R.B.H., Salim, S. and Wu, Y.M. WIT Transactions on Ecology and the Environment 98 (2006) Pages 43-54.

Incineration has top priority in Singapore to treat wastes that are not recovered, reused or recycled due to the limited territory for landfills. However, emissions from incineration contain gases with high polluting characteristics that can severely affect human health in the long term. This paper introduces a pyrolysis-gasification technology and compares it with an existing incinerator in operation in Singapore. Such technologies have received growing attention as the process can produce high quality fuels, such as Syngas. The stream of MSW – from generation to its final conversion – was studied using a life cycle assessment approach. Economic considerations and the economic values of the final products (electricity or Syngas) were evaluated. Without taking into account the social or economic costs of pollution, it was projected that the existing and proposed plants' annual values (pTotal) were nearly the same – approximately 70 million/year. However when air emission costs were taken into account, then the new pyrolysis-gasification technology displayed a considerable advantage over incineration. According to sensitivity analysis, the time to “pay back” the capital expenditure for the proposed plant changed significantly with fluctuations in the amount of Syngas produced as well as operating costs, but less with capital costs.

√IPENZ 25/68 The viability of advanced thermal treatment of MSW in the UK.

Fitchner Engineering Consultants. 2004.

Thermal treatment will play a role in achieving landfill diversion targets and alternative conversion technologies, especially gasification and pyrolysis, are of considerable interest. While both are established processes, they are not widely used, although they are perceived to have advantages over combustion, such as higher recycling rates, lower emissions and lower costs. However few of these perceptions are based on hard facts. Fichtner was commissioned to evaluate the commercial viability of gasification and pyrolysis technologies for the processing of residual municipal solid waste RMSW to assist those attempting to obtain a commercial waste management service in the UK. The review found that the commercial application these technologies to treat RMSW is not widespread in either the UK or Europe. Developing the technology is not the only challenge, it would need to be incorporated into a total solution that would outperform what is achievable with today's mature technologies.

IPENZ 25/69 Life cycle impact assessment of various waste conversion technologies.

Khoo, H. Waste Management, Volume 29, Issue 6, (June 2009)Pages 1892-1900.

Advanced thermal treatment technologies utilizing pyrolysis or gasification, as well as a combined approach, are introduced as sustainable methods to treat wastes in Singapore. Eight different technologies are evaluated: pyrolysis-gasification of MSW; pyrolysis of MSW; thermal cracking gasification of granulated MSW; combined pyrolysis, gasification and oxidation of MSW; steam gasification of wood; circulating fluidized bed (CFB) gasification of organic wastes; gasification of RDF; and the gasification of tyres. Life cycle assessment is carried out to determine the environmental impacts of the various waste conversion systems including global warming potential, acidification potential, terrestrial eutrophication and ozone photochemical formation.. A simplified life cycle cost comparison showed that the two most costs-effective waste conversion systems are the CFB gasification of organic waste and the combined pyrolysis, gasification and oxidation of MSW. The least favorable - highest environmental impact as well as highest costs - are the thermal cracking gasification of granulated MSW and the gasification of tyres.

IPENZ 25/70 Energy recovery from municipal waste: A case study for a middle-sized Italian district. Giugliano, M., Grosso, M and Rigamonti, L. Waste Management, Volume 28 Issue 1 (2008) Pages 39-50.

This paper reports the main outcome of research to compare and assess the merits of alternative strategies for energy recovery from municipal solid waste downstream of material recovery for an Italian province. Strategies analysed are based on well-established combustion technologies available at the commercial scale in the Italian market in comparison with an innovative but not yet proven option of refuse derived fuel gasification and subsequent co-combustion of syngas in a combined cycle power plant. The comparison is made using mass and energy balances, environmental assessment and economic analysis. From an energetic point of view, the best strategy is the one based on the refuse derived fuel gasification, which, on the contrary, does not show interesting environmental results. In this perspective, the best results are from strategies based on a dedicated plant, particularly when unsorted residual waste collected downstream of material recovery is used. Finally, from an economic point of view, the strategy with gasification allows the highest revenues from the sale of energy.

IPENZ 25/71 Assessment of materials management options for the Massachusetts Solid Waste Master Plan Review. Tellus Institute 2008.

This report looks at various current approaches to materials and solid waste management, including recycling, composting, landfilling and waste-to-energy incineration, in addition to emerging technologies such as gasification, pyrolysis and anaerobic digestion. Literature is reviewed and environmental effects are modelled. The focus is on lifecycle impacts. With regard to future trends, it appears that the prospects for anaerobic digestion facilities are more favourable than those for gasification and pyrolysis.

IPENZ 25/72 RDF production plants: I Design and costs.

Caputo, A and Pacifico, P. Applied Thermal Engineering, Volume 22, Issue 4 (March 2002,) Pages 423-437,

Municipal solid waste (MSW) management calls for the integration of different recovery, recycling and disposal technologies. Among these possible options, MSW may be treated in order to obtain a fuel to be sold to third party users or directly utilized to generate electricity provided it is of sufficient quality to be employed instead of traditional fuels. In this two-part paper the problem of producing refuse derived fuel (RDF) having a high heating value (LHV>4000 kcal/kg) has been examined from a technical and economic viewpoint.

IPENZ 25/73 RDF production plants: II Economics and profitability,

Caputo, A and Pacifico, P. Applied Thermal Engineering, Volume 22, Issue 4 (March 2002) Pages 439-448.

Special focus topics in previous IPENZ Engineering Updates

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