

00/00277 Zinc contamination in the cathodic material of exhausted alkaline manganese dioxide batteries

Vatistas N. and Bartolozzi, M. *J. Power Sources*, 1999, 79, (2), 199–204.
The cathodic compartment of the alkaline manganese batteries is contaminated by zinc ions from the anodic compartment during discharging; in this work, how discharging conditions affect the zinc concentration in the cathodic compartment is considered. Various conditions of discharging were tested and the mean and local concentration of zinc in the cathodic compartment were determined. Experimental results show that the cathodic compartment of discharged batteries contains a small concentration of zinc, and that the discharge conditions and the discharging level affect the concentration of the zinc in this compartment. A deeper knowledge of the chemical composition of spent batteries improves recycling processes and allows the cathodic and anodic materials to be recovered separately.

Economics, Policy, Supplies, Forecasts**00/00278 Analysing the power supply quality**

Fairhurst, D. *Energy World*, 1999, October, 273, 16–17.
In the deregulated world of electricity supply, medium to large commercial and industrial energy users might be forgiven for thinking that all they need to worry about is finding the lowest cost utility company and signing the annual supply contract. However, there are still two major considerations for energy users, which are closely connected: energy efficiency and power quality.

00/00279 Application of grey relation analysis to hydroelectric generation scheduling

Liang, R.-H. *Electrical Power & Energy Systems*, 1999, 21, (5), 357–364.
An approach based on grey relation analysis is proposed for the scheduling of hydroelectric generations. The purpose of hydroelectric generation scheduling is to figure out the optimal amount of generated power for the hydro units in the system for the next N h in the future. In the proposed approach, grey relation analysis is developed in order to reach preliminary generation schedules. Since some practical constraints may be violated in the preliminary schedule, a heuristic rule-based search algorithm is developed to reach a feasible suboptimal schedule which satisfies all practical constraints. The effectiveness of the proposed approach is demonstrated by short-term hydro scheduling of Taiwan power system. It is concluded from the results that the proposed approach is very effective in reaching proper hydro generation schedules.

00/00280 Artificial neural network for forecasting residential electrical energy

Al-Shehri, A. *Int. J. Energy Res.*, 1999, 23, (8), 649–661.
An artificial neural network (ANN) model for forecasting the residential electrical energy (REF) in the Eastern Province of Saudi Arabia is presented. A comparison of the neural model with the polynomial fit is made for validation purposes. The results show that the forecasting of the REF predicted by the ANN is closer to the real data than that predicted by the polynomial fit model.

00/00281 A basic framework for sub-transmission system health analysis

Gupta, R. and Goel, L. *Elec. Power Syst. Res.*, 1999, 49, (3), 195–200.
The reliability of supply in sub-transmission systems is usually quantified in terms of two sets of indices, the individual supply load point indices (average failure rate, average outage duration and average annual unavailability) and the system performance indices (SAIFI, SAIDI, CAIDI, ASUT, ASAI, etc.). These probabilistic indices are very useful not only for assessing the severity of system failures in future reliability predictions but also in assessing the system's past performance. Many utilities, however, continue to use deterministic methods (rule-of-thumb methods) to assess the reliability of their systems. This paper presents a method designated as system well-being analysis, which in addition to the conventional probabilistic risk index of supply point unavailability, also incorporates the specified deterministic criteria in defining additional system healthy and marginal states. The proposed method is illustrated in this paper to calculate the well-being indices of electric sub-transmission systems. The proposed technique, which can be used to evaluate the adequacy of sub-transmission systems, is applied in this paper to a small but comprehensive test system to show the effects of some pertinent factors and deterministic criteria on the system well-being indices.

00/00282 Cogeneration and electric power industry restructuring

Dismukes, D. E. and Kleit, A. N. *Resource & Energy Economics*, 1999, 21, (2), 153–166.
In 1978, Congress passed the Public Utilities Regulatory Policies Act (PURPA) in response to the energy crisis of the early 1970s. One of the unintended results of PURPA has been to show that electric generation was not a natural monopoly and could be opened to competition. Both the theoretical and empirical determinants of cogeneration and how they may be affected by future electric power industry restructuring are important for

future industrial generation decisions. This paper explores these determinants and identifies differences between industrial cogenerators which sell power back into the electricity grid (commercial generators) and those which keep all of their electricity generation for internal purposes (self generators). The empirical results indicate that increases in industrial firm technical capabilities tends to increase their probabilities of both commercial and self generating. In addition, the models indicate that increases in retail electricity prices and industrial output increases industrial generation probabilities. The ability to switch fuels enhances industrial generation probabilities, as does a decrease in the price of natural gas. The results also imply that under electric restructuring a number of industrial generators may find that they face a stranded cost problem much like the one faced by their electric utility counterparts.

00/00283 Development and testing of a bipolar lead-acid battery for hybrid electric vehicles

Saakes, M. et al. *J. Power Sources*, 1999, 78, (1–2), 199–203.
An 80 V bipolar lead-acid battery was constructed and tested using hybrid electric vehicle (HEV) drive cycles. Drive cycles with a peak power of 6.7 kW, equal to one-fifth of the total power profile required for the HEV studied, were run successfully. Model calculations showed that the 80 V module constructed, which is at the moment 2.5 times heavier than required for the HEV operation studied, can be optimized to meet the requirements.

00/00284 Developments in lead-acid batteries: a lead producer's perspective

Frost, P. C. *J. Power Sources*, 1999, 78, (1–2), 256–266.
Rapid progress is being made in many aspects of materials, design and construction for lead-acid batteries. Much of this work has taken place under the auspices of the Advanced Lead-Acid Battery Consortium (ALABC). From the general tone of the literature, it seems likely that several of these developments will be adopted in commercial products, and that there will be cross-fertilization between the emerging electric vehicle (EV) battery technology and the starting, lighting and ignition (SLI) battery. Given the impetus for improvement from several different factors, the development process appears to be accelerating. To those not intimately involved in the battery design and specification process, it is not clear which of the possible developments will make it from the laboratory to general commercial adoption. Some of the possible changes in materials, design and construction could have an impact on the recovery, recycling, smelting and refining of lead-acid batteries. Some of the possible developments are outlined and their possible impact is discussed. It is likely that negative effects may be minimized if battery developments are considered from other perspectives, largely based on the overall life-cycle, as early in the design phase of new products as possible. Three strategies for minimizing undesirable effects are advocated: first, improved communication between car manufacturers, battery manufacturers and lead producers second, use of life-cycle analysis (LCA) to identify and optimize all attributes of the product throughout its life-cycle third, concerted and coordinated action to deal with issues important to the industry once trends are identified.

00/00285 Effects of Amendments to the Basel Convention on battery recycling

Stone, H. *J. Power Sources*, 1999, 78, (1–2), 251–255.
The Basel Convention was originally designed to prevent the uncontrolled dumping of toxic waste and focused particularly on shipments of materials from OECD countries to the developing world. Amendments to the Basel Convention now restrict trade in waste materials destined for recycling, reprocessing and reuse. There are serious consequences for the secondary lead industry and the world community if the regulations prohibit the environmentally sound reprocessing of scrap batteries. It is incumbent on the industry to understand the implications of the recent and proposed amendments, and to address the potential problems posed by the legislation.

00/00286 Electric vehicles in the next millennium

Harding, G. G. *J. Power Sources*, 1999, 78, (1–2), 193–198.
It is well known that the history of battery electric vehicles (EVs) is a long one that covers a period in excess of 100 years. It is also well known that, in their early days, these vehicles were capable of out-performing their contemporary internal combustion-engined (ICEV) equivalents in terms of speed and acceleration. Since those days, and indeed until quite recently, there has been a quite remarkable difference between the vast strides made in developing ICEVs in general and cars in particular, and the relatively small improvements made in the capabilities of EVs. It is now being argued that this must change and the purpose of this paper is to consider the extent to which it is practical to expect such a change, on a large scale, in the early part of the next millennium.

00/00287 Enhancement of thermal unit commitment using immune algorithms based optimization approaches

Huang, S.-J. *Electrical Power & Energy Systems*, 1999, 21, (4), 245–252.
A new approach using immune algorithms to solve thermal generation scheduling problems is proposed in this article. In the proposed scheme, the objective functions and constraints were categorized as antigens. The antibodies for the immune system were determined through the calculation of affinity. For an antibody that is perfectly combined with the antigen, this antibody is deemed the solutions to the problem. With the embodiment of affinity computation, the possibility of stagnation in the iteration process