

97/02461 Valve system

Croucamp, F. W. and Nunez, L. J. R. Eur. Pat. Appl. EP 735,145 (Cl. C21B9/12), 2 Oct 1996, ZA Appl. 95/2,615, 30 Mar 1995, 8 pp.
The authors report the development of a valve for handling a hot fluid material such as the coal dust formed in the smelting of direct reduced Fe ore. In this system, those parts of the valve body in direct contact with the material have double walls which contain a nonfluid medium such as kaowool between them for heat insulating the walls. Those parts which do not have direct contact, however, are cooled with a fluid medium such as water.

97/02462 Wastefree in-duct FGD

Nelson, S. Jr. *Proc. Annu. Int. Pittsburgh Coal Conf.*, 1995, 12, 80-85.
A new sorbent concept, called Fluesorbent, has been developed specifically to address the problems of modest performance, particulate non-compliance and difficult waste disposal experienced in previous technologies. A 6500 acfm, 2-MWe Fluesorbent pilot plant was recently constructed at Ohio Edison's R. E. Burger station. This paper describes the technology and the Burger demonstration project.

17 ENERGY

Supplies, Policy, Economics, Forecasts

97/02463 Advances in the understanding of the industrial mineral resources of the state of Georgia

Cocker, M. D. and O'Connor, B. J. *Bull.-N. M. Bur. Mines Miner. Resour.*, 1995, (Pub. 1996), 154, (Proceedings of the 31st Forum on the Geology of Industrial Minerals—The Borderland Forum), 197-205.
The paper details an accelerated programme of studies to improve the base of geological information on Georgia's mineral resources which has recently been concluded. Heavy minerals, construction sand and gravel, offshore phosphates were studied, as well as stratigraphy and geology of the kaolin belt in the Coastal Plain province; pegmatites, talc deposits, granite and granitic gneiss, and mafic and ultramafic rocks in the Piedmont and Blue Ridge provinces and high-magnesium carbonate rocks (dolostones), ceramic clays and shales, manganese deposits, and coal in the Valley and Ridge province. Data obtained during these studies should be helpful in defining feasibility of and guidelines for offshore mining, guidelines for protection of aquifers, construction material for continued growth of population centres in Georgia, and potential health hazards to drinking-water resources.

97/02464 Assessment of strategic approaches to the commercialization of fuel cells

Nurdin, M. *Journal of Power Sources*, 1996, 61, (1-2), 15-20.
The state of commercialization of fuel cells is assessed and a comparison is made with forecasts made at the 1991 Grove Fuel Cell Symposium. The paper evaluates applications appropriate to different technologies and outlines arguments that each technology should be commercialized for those applications, stationary and mobile, for which it is suitable when it becomes sufficiently technically mature. Comparisons are drawn between the governmental approach of commercialization of fuel cells in Japan, U.S.A. and Europe. It has been pointed out that phosphoric acid fuel cells have reached sufficient technical maturity and should be brought to the point of competitive commercialization. Finally, suggestions are made as to how commercialization of fuel cells could proceed.

97/02465 The changing nature of the power generation market—does it create opportunities for fuel cells?

Cragg, C. T. *Journal of Power Sources*, 1996, 61, (1-2), 1-6.
The global power industry is surveyed with the objective of discovering trends that might encourage a greater use of fuel cells. The subject is broken into four basic themes: (i) an increasing demand for electricity (ii) a general trend towards privatization and deregulation in the power sector, (iii) contrary to (ii), the need for supplying security in its most basic sense is increasing rather than declining as power-dependent technology becomes progressively more important in the modern economy, and (iv) the trend in technology, particularly environmental-friendly technology, towards the smaller size of production centres. The paper concludes that there are encouraging prospects for the fuel cell economy.

97/02466 Design of small coal and waste co-fired AFBC for rural villages

Bonk, D. L. et al. *Proc. Int. Conf. Fluid. Bed Combust.*, 1995, 13, (2), 1159-1169.
This paper details the development of a conceptual design for a coal-fired, 500-kW, fluidized bed combustion (FBC) power plant for use in rural Alaskan villages. The power generating plant will utilize local coal and innovative fluidized bed combustion to produce base load electrical power,

reduce dependence upon imported oil, and reduce costs and problems associated with the disposal of solid municipal wastes. To ensure site conditions would model those found in Alaska, the town of McGrath, Alaska, in the Doyon region of the upper Kuskokwim river valley was selected as a potential plant site. This paper describes the project definition plant design for McGrath, Alaska, and the costs associated with construction and operation in a remote environment.

97/02467 Domestic fuel energy consumption in an Indian urban ecosystem

Misra, N. C. et al. *Biomass and Bioenergy*, 1995, 9, (6), 473-486.
Ninety-three percent of people in Berhampur, Orissa State, earn their living from non-primary economic activities. The fuel consumption structure reveals an element of rural bias since the domestic sector derives 49% of its energy used for cooking and heating from biomass sources. Firewood is the only fuel used by all income groups and almost all occupations. Other traditional fuels such as dungcake, agricultural waste and leaf litter are used in the town with different degrees of dominance in various occupation groups and income classes. The inequality of income distribution is reflected in the fuel consumption structure of the rich and poor. A greater dependence on non-biomass can be observed in the high income group and on biomass in the low income group. Family size is an important determinant of biomass fuel use. For the urban poor, there is a relationship between income and fuel consumption. Scope exists for enlarging the biomass base by utilizing the available bio-wastes and developing a green belt around the town. This requires some rural features in the urban area using new technologies.

97/02468 Energy planning and optimization model for rural development—a case of sustainable agriculture

Raja, R. et al. *International Journal of Energy Research*, 1997, 21, (6), 527-548.

Using Linear Programming, an optimization model for sustainable agriculture development in the Chellampatti block of Madurai District, Tamil Nadu, Southern India, was developed. It is based on the availability of various energy sources in the block, and the requirements of various human and agricultural activities. The model optimizes the distribution of land for cultivating various crops based on the block's energy resources limitations and also to meet the minimum energy requirements of human beings and animals. The paper also suggests that the model can be modified to suit the local conditions so that it can have universal application for sustainable agriculture development.

97/02469 Fuel cells for distributed power generation

Tarman, P. B. *Journal of Power Sources*, 1996, 61, (1-2), 87-89.
A major change in power distribution in the USA has been observed due to deregulation. Large central power stations are being and will continue to be replaced by smaller, distributed power generation sources of less than 20 kW. Fuel cells, specifically molten carbonate fuel cells (MCFCs), are best suited to serve this need. Small turbines cannot achieve the efficiency or environmental friendliness of MCFCs in this power range. This paper discusses the goals of M-C power corporation and the advantages of its IMHEX MCFC technology. M-C power's factory, demonstration testing program, and its market-entry power plant are also described, as are its commercialization strategy and schedule.

97/02470 Improvement of plant performance: a few Indian case studies

Rao, T. C. *Miner. Process.: Recent Adv. Future Trends, Proc. Conf.*, 1995, 299-310. Edited by Mehrotra, S. P. and Shekhar, R. Allied Publishers, New Delhi, India.

This paper outlines plant performance improvement studies carried out on the closed circuit grinding at Rakha Copper Concentrator of Hindustan Copper Limited, dense medium cyclone circuit at Dugda II washery of Central Coal Washeries Organization and West Bokaro washery I of Tata Iron and Steel Company. It was shown that the laboratory findings can be effectively utilized to improve the plant performance. The necessity of sustained investigation and development work in the operating plants and the potential monetary benefits are highlighted.

97/02471 Investigations on the co-combustion of plastics waste in a pulverized-coal firing system

Christill, M. et al. *Chem.-Ing.-Tech.*, 1996, 68, (7), 845-848. (In German)
An experimental combustion chamber was used to investigate the combustion of polyethylene of various particle size. The combustion of its mixtures with other plastics together with natural gas and with pulverized coal was also studied. The combustion behaviour was assessed by CO, CO₂, organic C, and O measurements in flue gas and by visual observations. Plastic particles with diameter ≤ 2 mm were successfully incinerated in the experimental plant at up to 80% of the total thermal load. Combustion of plastics as additional fuel in power plants is discussed.

97/02472 Purchasing-power-parity (PPP) approach to energy-efficiency measurement: implications for energy and environmental policy

Birol, F. and Okogu, B. E. *Energy*, 1997, 22, (1), 7-16.
The PPP approach offers an alternative to the traditional measure of national output, which may capture the real value of the GDP. In general, this approach raises the incomes of developing countries by a substantial

amount, and this has serious implications for energy indicators on which policies are usually based. A further problem is that non-commercial energy is usually left out of energy-intensity calculations. In this paper, the authors analyse the issue of energy-efficiency and carry out calculations based on three approaches: the traditional approach, the PPP-based income approach and an approach which includes non-commercial energy. The main conclusion is that applying the PPP method in energy-intensity calculations may be misleading.

97/02473 Structural analyses of coal extraction oil and hydrogenated oil according to homologous compound types

Sugibuchi, H. *et al* *Kaigi Happyo Ronbunshu*, 1993, 30, 133–136. (In Japanese)

In this study, chemical structure between extraction oil and hydrogenation oils, which were derived by hydrogenation of extraction residues, were compared according to their group composition by using FI and EI MS. The conclusion can be drawn that the chemical structure of these components was more influenced by coalification reaction and therefore naphthenic rings altered aromatic structure accompanying the polymerization reaction to macromolecular structure.

97/02474 Texas-industrial minerals, imports, and exports

Sweet, P. C. *Bull. -N. M. Bur. Mines Miner. Resour.*, 1995, (Pub. 1996), 154, (Proceedings of the 31st Forum on the Geology of Industrial Minerals—The Borderland Forum), 43–48.

The topic of this paper is industrial mineral production in Texas. The bulk of this production is cement, construction sand and gravel, and crushed stone. Fossil-fuel production is large in the State and in 1992 included more than 50 million metric tons (mt) of coal, 650 million barrels of petroleum, and 6.18 trillion cubic ft of natural gas. Texas ranks first in the United States in production of both petroleum and natural gas.

18 ENERGY CONVERSION AND RECYCLING

97/02475 Application of the pyrochemical process to recycle of actinides from LWR spent fuel

McPheeters, C. C. *et al* *Progress in Nuclear Energy*, 1997, 31, (1/2), 175–186.

The recycling of all of the actinides contained in spent IFR fuel is part of the Integral Fast Reactor (IFR) process and thus waste disposal challenges are reduced. Pyrochemical processes also appears suitable for recovering and recycling actinides from spent fuels from light water-cooled reactors (LWRs). Following surveys of many pyrochemical processes, two candidates have been selected for further development. A calcium/salt transport process operating at 800 to 850°C appears to recover the transuranic (TRU) elements efficiently. An alternative, and currently preferred, process involves a lithium reductant operating at about 650°C. Basic laboratory work shows that either process would be feasible and engineering-scale experiments are being prepared.

97/02476 Bio-recycle metallurgy by utilization of algae

Yazawa, A. and Kuwabara, T. *Miner. Slovaca*, 1996, 28, (5), 313–317. (In Czech)

This paper outlines a proposal to conserve the global environment. It suggests the use of bio-recycle metallurgy for absorption of CO₂ regeneration of energy and recovery of metal from lean resources. Recycling of CO₂ as fuel is not feasible economically, but it would be reasonable if some biomass can serve as media of metallurgical separation as well as fuel. By use of algae, a part of traditional metallurgy may be replaced by bio-recycle metallurgy. The biosorption of metals by algae is discussed and based on the experimental results. Various applications are suggested for metal extraction and wastewater treatment.

97/02477 Clean fuels from municipal solid waste for fuel cell buses in metropolitan areas

Larson, E. D. *et al* *Resources, Conservation and Recycling*, 1996, 17, (4), 273–298.

The production of clean transportation fuels (methanol or hydrogen) from MSW is one economically and environmentally promising option for dealing with problems of MSW disposal. An attractive feature is that the elimination of essentially all the air pollutant emissions is inherent in the process. Methanol or hydrogen used in fuel cell vehicles (FCV) can help address problems of deteriorating urban air quality due to vehicle pollution and heavy dependence of the transport sector on imported petroleum. Buses are initial targets for commercial application of fuel cells. Coupled with FCVs, MSW could become a major transportation energy resource. The authors claim that, because of the high fuel economics expected for fuel cell buses, total lifecycle costs per bus-km could be lower than for conventional diesel-engine buses.

97/02478 Manufacture of coal ash-containing solidified articles with cylindrical shape

Imai, O. *Jpn. Kokai Tokkyo Koho JP 08,231,260* [96,231,260] (Cl. C04B28/18), 10 Sep 1996, Appl. 95/38,015, 27 Feb 1995, 6 pp. (In Japanese) The coal ashes as wastes are recycled in the cylindrical articles of poles, pipes, etc., for construction.

97/02479 Processing of metallurgy dust and sludge wastes with lime and coal fines for recycling to blast furnace in steelmaking

Osing, D. A. A. *Ger. Offen. DE 19,512,560* (Cl. B03B9/04), 10 Oct 1996, Appl. 19,512,560, 4 Apr 1995, 5 pp. (In German)

The process for smelting dust and/or sludge wastes (especially from an electric-arc furnace) is described. It is as follows: (a) mixing with powdered lime for drying; (b) mixing the resulting dry fines with coal and/or coke dust as well as a limestone-rich flux with granulation; and (c) injecting the granules of 1–6 mm size into a blast furnace for smelting, or optionally into a steelmaking melt for alloying. The process is suitable for recovery of Fe and other metals from the dust and sludge wastes. In addition, it is also suitable for recycling the carbonaceous and limestone wastes into the granulated smelting mixture.

97/02480 Recycling of industrial ash residues as glass ceramics

Garcia H. *et al* *Span. ES 2,078,142* (Cl. B09B3/00), 1 Dec 1995, Appl. 9,300,786, 16 Apr 1993; 8 pp. (In Spanish)

The paper investigates the following recycling process: industrial ashes are mixed with collet, homogenized and thermally treated (at greater than the melting point and lower than 1600°C) to form a glass, and then thermally treated a second time to form a glass ceramic.

97/02481 Use of plastics as reducing agent in the blast furnace as a way of their recycling

Lindenberg, H. U. *et al* *Stahl Eisen*, 1996, 116, (8), 89–93. (In German) The use of granulated plastic wastes as reducing agents in steel blast furnaces, as substitutes for oil and coal, is explored. The emissions of air pollutants were low. A comparison between the use of plastics in the furnace process to other recycling methods with respect to environmental protection aspects is presented.

97/02482 Waste to energy in Fayetteville, NC, USA

Anon. *Alternate Fuels IV Conf., Proc., 4th*, 1994, 223–226. Council of Industrial Boiler Owners, Burke, Va.

In 1995, a bubbling fluidized bed waste-to-energy boiler, which includes materials recovery and energy generation facilities, was started up in Fayetteville, North Carolina. Each year, the materials recovery facility processes 245,000 tonnes (110 tonnes solid waste/h) of municipal solid waste from three counties, recovering Al, ferrous metals, paper, cardboard, and plastics. The remaining portion, ~70%, is converted into refuse-derived fuel; for every tonne of refuse-derived fuel burned, two barrels of oil corresponding to 0.5 tonne coal will be saved. The turbulent mixing of air and fuel in combination with low excess air, provides uniform, complete combustion and low NO_x formation.