

AUTHORS — MID-AUGUST 1977

REACTORS

A MATHEMATICAL MODEL FOR AN INTEGRAL ECONOMIZER U-TUBE STEAM GENERATOR

*D. C. Arwood
T. W. Kerlin*

Don Arwood (top) (BS, 1973; MS, 1975, nuclear engineering, University of Tennessee) works for the Tennessee Valley Authority. T. W. Kerlin (PhD, University of Tennessee, 1966) is a professor in the Nuclear Engineering Department at The University of Tennessee and is director of the Power Plant Dynamics, Control and Testing Division of The University of Tennessee Engineering Experiment Station. He is interested in power plant dynamic modeling and testing.



THERMAL SHOCK EFFECTS IN FAST BURST REACTORS

*G. P. Mulholland
T. F. Luera
A. De La Paz*

George P. Mulholland (top) (PhD, mechanical engineering, Oklahoma State University, 1967) is an associate professor of mechanical engineering at New Mexico State University. His current interests are heat transfer, thermal stress analysis, and solar energy applications. T. F. Luera (center) (BS, MS, physics, University of Chicago; PhD, nuclear engineering, University of New Mexico and Sandia Laboratories) has been employed at the Nuclear Weapons Effects Laboratory, White Sands Missile Range (WSMR) since 1965. His assignments have included evaluation of radiation effects on weapon systems, reactor leader for the WSMR Fast Burst Reactor (FBR), technical coordination, and research and development projects. A. De La Paz (bottom) (BS, MS, chemical engineering, Tulane University; graduate work, nuclear engineering, University of Pittsburgh) completed five years in the Naval Nuclear Power Program and then joined the Army Reactor Program. He was the first permanent chairman of the Army Reactor Health and Safety Review Committee. He is presently chief of the Nuclear Weapons Effects Laboratory and reactor specialist for the WSMR FBR. In addition to nuclear effects work, he teaches nuclear engineering and is interested in nuclear fuel cycle analysis.



ISOTOPIC ENRICHMENT OF PLASMA EXHAUSTS FROM CONTROLLED THERMONUCLEAR REACTORS BY CRYOGENIC DISTILLATION

Balabhadra Misra (top) (PhD, chemical engineering, Columbia University, 1957) is an engineer at Argonne National Laboratory (ANL). He has in the past conducted calculational and experimental studies of heat transfer and fluid flow in conjunction with the space program and, more recently, the liquid-metal fast breeder reactor program. His current research activities involve the development of computer models for fusion reactor systems analyses, including thermal hydraulics performance and isotope separations. Victor A. Maroni (PhD, chemistry, Princeton University, 1967) is a chemist at ANL and is presently leader of the Fusion Reactor Research Group in the Chemical Engineering Division. His past research activities have included investigations of the structural and thermodynamic properties of liquid-metal and molten-salt solutions. He is presently engaged in developmental studies of fuel recycle and blanket processing systems for fusion reactors.

*Balabhadra Misra
Victor A. Maroni*



NUCLEAR ANALYSIS OF A TOKAMAK EXPERIMENTAL POWER REACTOR CONCEPTUAL DESIGN

Mohamed A. Abdou (top) (PhD, nuclear engineering, University of Wisconsin, 1973) is in the Applied Physics Division at Argonne National Laboratory (ANL) and is the manager of the fusion reactor systems studies. His current interests are focused on the technology problems in fusion energy systems, particularly nuclear analysis, blanket engineering, economics, and fusion reactor design and modeling. Jungchung Jung (PhD, nuclear engineering, 1973) is in the Applied Physics Division at ANL with the Fusion Reactor Neutronics Group. He has conducted research on various problems of transport theory. His current interests are method developments and analysis for nuclear design of fusion reactor blankets and shields.

*Mohamed A. Abdou
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MIGRATION OF METALLIC FISSION PRODUCTS IN REACTOR OXIDE FUELS

F. D'Annuncci (top) (PhD, physics, University of Pisa, Italy, 1974) is a student-trainee at the European Institute for Transuranium Elements, Karlsruhe, Federal Republic of Germany (FRG). He is interested in the thermodynamics of oxide fuels. C. Sari (center) (PhD, physical chemistry, Universities of Milano and Torino, Italy, 1956) is a scientist at the European Institute for Transuranium Elements, Karlsruhe, FRG. He is interested in the structures and thermodynamics of fast breeder reactor fuels. G. Schumacher (bottom) (Dr. Ing., University of Karlsruhe, 1970) has been working since 1961 at the Institut für Neutronenphysik und Reaktortechnik, Kernforschungszentrum Karlsruhe, in the field of thermodynamics of nuclear materials. He is mainly interested in transport processes in fuel pins.

*F. D'Annuncci
C. Sari
G. Schumacher*



THE IMPORTANCE OF HEAT TRANSFER IN HYPOTHETICAL CORE DISRUPTIVE ACCIDENT ANALYSIS

Paul B. Abramson

Paul B. Abramson (BS, engineering mechanics, Lehigh University, 1961; PhD, physics, University of Colorado, 1968) is currently group leader for reactor accident modeling in the Applied Physics Division at Argonne National Laboratory. From 1962 through 1965 he was at Atomics International, and from 1968 to 1974 he was Chairman of Physics at Colorado's Metropolitan State College in Denver (where he was also elected Alderman and later Mayor of the city of Wheat Ridge, Colorado, as an extracurricular activity). His current interests are in fast reactor accident modeling, with specific interest in numerical compressible hydrodynamics and basic phenomenology in heat transfer.



BASIS FOR SUBCRITICAL LIMITS IN PROPOSED CRITICALITY SAFETY STANDARD FOR MIXED OXIDES

E. Duane Clayton (top left) (PhD, physics, University of Oregon, 1952) is currently associate manager of nuclear criticality at the Battelle-Pacific Northwest Laboratories (PNL), and research associate professor in the University of Washington's Department of Nuclear Engineering. He is past chairman of the Nuclear Criticality Safety Division of the American Nuclear Society (ANS), a pioneer in criticality studies with plutonium, and, since its inception in 1961, director of the Plutonium Critical Mass Laboratory of PNL. Clayton is currently chairman of Work Group 12 within ANS Subcommittee 8 (Fissionable Materials Outside Reactor) of the ANS Standards Committees. His current technical interests include most aspects of criticality measurements and studies. Hugh K. Clark (top right) (PhD, physical chemistry, Cornell University, 1943) is a research associate in the Reactor Physics Division of the Savannah River Laboratory. His interests lie in developing calculational methods for criticality safety evaluations. He has been active in work of ANS Standards Subcommittee 8 to develop criticality safety standards. Dale W. Magnuson (center left) was a Union Carbide Nuclear Division research staff member at the Oak Ridge Critical Experiments Facility from 1955 to 1973, when he transferred to the Laser Isotope Separation Project at the Oak Ridge Gaseous Diffusion Plant. He has served on the Oak Ridge National Laboratory Nuclear Criticality Safety Committee since 1967 and also on several ANS Standards Committees. J. H. Chalmers (bottom right) (C. Eng., M. I. Mech. E.) is a senior inspector in the Nuclear Installations Inspectorate (NII), Liverpool, England, primarily concerned with fuel element storage and reprocessing facilities. He also acts as an advisor to NII on criticality matters. Gordon Walker (bottom left) (BSc, chemistry,

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University of Sheffield) joined the U.K. Atomic Energy Authority in 1959 and is a member of the Safety and Reliability Directorate. He has specialized in the criticality safety of process plants, an area that remains of principal interest to him. Norman Ketzlach (top right) (MS, chemical engineering, University of Washington, 1944) is a senior scientist in the Division of Fuel Cycle and Material Safety of the U.S. Nuclear Regulatory Commission and has had primary responsibilities in nuclear criticality safety since 1955. He is a member of ANS and the American Institute of Chemical Engineers, and serves on several work groups for the development of standards associated with nuclear criticality safety. Ryohei Kiyose (top left) (Dr. Eng., University of Tokyo, 1976) is currently a professor of nuclear chemical engineering in the Department of Nuclear Engineering at the University of Tokyo. He is a member of the Executive Committee of the Japan Section of the RAS and of the Technical Advisory Committee for Safety Review of Nuclear Fuel Facilities, Japan Atomic Energy Commission. He also holds memberships in the Institute of Nuclear Materials Management (Japan Section), the Atomic Energy Society of Japan, the Physical Society of Japan, and the Society of Chemical Engineers, Japan. His technical interests are centered in the nuclear fuel cycle (criticality safety, safeguards technology, safety and environmental assessment, in-core fuel management, fuel reprocessing, and waste management). C. L. Brown (center right) (BS, chemistry, University of Utah, 1947) is the manager of the Nuclear Criticality Section at PNL. His areas of interest are in critical mass physics and criticality safety analysis as applied to nuclear plant processes. D. R. Smith (bottom left) (MS, physics, Washington University, 1949) has been a staff member of the Los Alamos Scientific Laboratory (LASL) since 1949. For the past 15 years, he has been a member of the critical experiments group at LASL, and he also serves as the LASL nuclear criticality safety officer. Ricardo Artigas (bottom right) (PhD, nuclear engineering, Purdue University, 1967) is the manager of the Reactor Safety Assurance, Product and Quality Assurance Operation in the Nuclear Energy Systems Division at General Electric Company, and is currently responsible for managing a division-wide program of review and audit in the areas of reactor and nuclear safety.



NEUTRON MULTIPLICATION AND SHIELDING PROBLEMS IN PRESSURIZED WATER REACTOR SPENT FUEL SHIPPING CASKS

C. M. Devillers (top) (Engineer, Ecole Centrale de Paris, 1961) is associate manager of the Applied Mathematics and Reactor Study Service, Commissariat à l'Energie Atomique, Saclay, France. His current interests are in reactor shielding, radiation transport applications, radiation damage, and more recently, reactor physics and reliability analysis. P. T. Blum is manager of the Technical Department, Transnucleaire S.A., Paris, France. He has been involved in spent fuel shipping cask development for 15 years. His current interests are in heat transfer, nuclear fuel technology, and nondestructive irradiated fuel examination.

C. Devillers
P. Blum



PROBABILITY DISTRIBUTIONS OF PEAK-CLAD TEMPERATURE AND CLADDING OXIDATION THICKNESS IN LOSS-OF-COOLANT ACCIDENTS FOR A TYPICAL BOILING WATER REACTOR

*T. Shimooke
K. Matsumoto*

T. Shimooke (right) (PhD, nuclear engineering, Kyoto University) is presently chief of the Reactor Safety Evaluation Laboratory at Japan Atomic Energy Research Institute (JAERI), where he and his members have worked in safety analyses, including loss-of-coolant accident (LOCA) studies for light water reactors. K. Matsumoto (left) (BS, Waseda University, 1975) is one of the members of the laboratory at JAERI and is interested in fuel behavior during LOCAs.



ON THE PELLET-CLADDING INTERACTION PHENOMENON

*J. T. A. Roberts
E. Smith
N. Fuhrman
D. Cubicciotti*

J. T. Adrian Roberts (top left) (PhD, metallurgy, Manchester University, England, 1968) is a program manager in the Nuclear Division of the Electric Power Research Institute (EPRI), Palo Alto, California. He is responsible for the Core Materials Program in the Nuclear Systems and Materials Department, which emphasizes light water reactor (LWR) fuels technology. E. (Ted) Smith (top right) (PhD, metallurgy, Sheffield University, U.K., 1957) has been a professor of metallurgy in the Joint University of Manchester/UMIST Department of Metallurgy, Manchester, U.K., since 1968. He is a consultant with Failure Analysis Associates, Palo Alto, California, working on the EPRI Fuel Rod Performance Program. Between 1961 and 1968 he was head of the Metallurgical Engineering Section, Central Electricity Research Laboratories, Leatherhead, U.K., and between 1955 and 1961, he worked at the Associated Electrical Industries Research Laboratory, Aldermaston, U.K. N. Fuhrman (bottom left) (BChE, Rensselaer Polytechnic Institute, 1949; PhD, chemistry, Polytechnic Institute of Brooklyn, 1953) is a senior consulting engineer at C-E Power Systems, Combustion Engineering, Inc., Windsor, Connecticut. He is active in LWR fuel performance evaluation in the Fuels Development Department and was the principal investigator in the Maine Yankee Core I postirradiation examination program. D. Cubicciotti (bottom right) (BS, 1942; PhD, 1946, chemistry, University of California, Berkeley) worked on the Manhattan Project from 1944 to 1946. Since then, he has worked at Atomics International and with the General Electric Company. He is presently with the Stanford Research Institute, working on the EPRI project on Zircaloy stress corrosion cracking. His interest is in high-temperature chemistry research.



SIMULATION STUDY OF THE RESTRUCTURING OF ADVANCED FUEL HEATED IN A RADIAL TEMPERATURE GRADIENT

C. Sari

C. Sari (PhD, physical chemistry, Universities of Milano and Torino, Italy, 1956) is a scientist at the European Institute for Transuranium Elements, Karlsruhe, Germany. His interests include structures and thermodynamics of fast breeder reactor fuels.



STUDY OF URANIUM-PLUTONIUM CARBIDE-BASED FUEL SIMULATING HIGH BURNUP

U. Benedict (top left) (PhD, physical metallurgy, University of Saarbrücken, Germany, 1959) is involved with the crystallographic study of nuclear fuel materials. His interests include fission product behavior in fuels and crystallographic properties of higher actinide compounds. G. Giacchetti (bottom center) (PhD, physical science, University of Milano, Italy, 1961) has worked in the areas of neutron spectrometry and nuclear fuel development. His current interests include electron probe microanalysis and physical chemistry of irradiated fast breeder fuels. Hj. Matzke (top center) (PhD, physics, University of Braunschweig, Germany, 1964) is involved with diffusion measurements. His interests include high-temperature atomic processes, surface phenomena, and radiation damage. K. Richter (bottom left) (Diplom-Ingenieur, Bergakademie Clausthal-Zellerfeld, Germany, 1957) is involved with the development of nuclear fuels. C. Sari (bottom right) (PhD, physical chemistry, University of Milano and Torino, Italy, 1956) is interested in structures and thermodynamics of fast breeder reactor fuels. H. E. Schmidt (top right) (PhD, physics, University of Stuttgart, Germany, 1958) is interested in problems of heat transfer in nuclear fuel materials. All authors are senior scientists and group leaders at the European Institute for Transuranium Elements (EURATOM), Karlsruhe, Federal Republic of Germany.

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ECONOMICS

SIMULATION OF THE NUCLEAR POWER ECONOMY

Mark B. Triplett (MS, engineering sciences, Purdue University, 1975) is a systems analyst at Battelle's Columbus Laboratories. His interests are in the application of systems analysis and systems engineering techniques to problems related to energy policy. Recently, he has participated in studies of fusion power development strategies and estimation methods for power plant capital costs.

Mark B. Triplett



MATERIALS

BASIC COMPATIBILITY STUDIES OF ADVANCED FUELS WITH 3d TRANSITION METALS

E. C. Beahm (top) (PhD, physical chemistry, Pennsylvania State University, Materials Research Laboratory, 1973) is a research staff member of the Chemical Technology Division of the Oak Ridge National Laboratory (ORNL). His current research interests are materials-related problems of nuclear reactor fuels with emphasis on thermodynamics. C. A. Culpepper is a science technologist in the Solid State Division of ORNL. He has 29 years of experience in the preparation and characterization of materials. His current activities involve the development of techniques for the preparation and fabrication of actinide alloys and inorganic compounds.

*E. C. Beahm
C. A. Culpepper*



METHODS OF SHIELD ANALYSIS FOR PROTECTION AGAINST ELECTRONS IN SPACE

*John W. Wilson
Fred M. Denn*

John W. Wilson (left) (PhD, physics, College of William and Mary, 1975) is a senior research scientist at the National Aeronautics and Space Administration Langley Research Center and adjunct assistant professor at the Old Dominion University. His current interests are ionizing radiation research (with special emphasis on heavy ions) and direct nuclear-pumped lasers. Fred Denn (right) (BS, physics, University of Wisconsin, River Falls, 1975) is a graduate physics student at the Old Dominion University. He has recently completed work on space radiation protection requirements at geostationary altitudes and currently works on neutronics calculations in connection with direct nuclear-pumped laser research.



ON THE EFFECTIVE TEMPERATURE OF AN EXPANDING TUBE WITH A RADIAL TEMPERATURE GRADIENT OVER THE WALL

*W. Van Witzenburg
L. G. J. Janssen
J. Prij*

Wim van Witzenburg (top) (PhD, physics, University of Toronto, 1963), a scientist at the Materials Division of the Netherlands Energy Research Foundation (ECN), Petten, has participated in the SNR-300 Fast Breeder Safety Programme. His current activities are related to radiation damage of fusion reactor materials. Lambertus G. J. Janssen (center) (Ir., Technological University of Eindhoven, The Netherlands, 1971) is head of the Applied Mechanics Group of ECN. His current technical interests are in the applied mechanics aspects in reactor safety and waste disposal. Jan Prij (bottom) (Ing., College Advanced Technology of Groningen, The Netherlands, 1966) is a collaborator in the Applied Mechanics Group of ECN. His current technical interests are in fracture mechanics and structural reliability.

