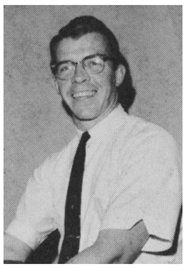
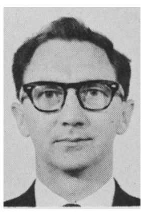
AUTHORS AND PAPERS

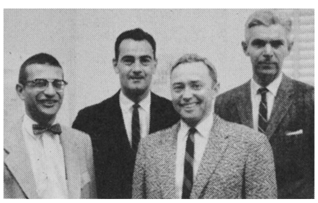


N S SAVANNAH CONTAINMENT TESTS

For the nuclear ship *Savannah*, engineered safeguards have a special significance because the reactor operates in or near densely populated areas. To reduce port entry restrictions, much attention has been given to containment integrity during the past two years. Containment leak-rate test results obtained at several pressures shed some light on the question of pressure-leakage relationships. A test series early in this program indicated that the flow was predominantly of the viscous nature.

Mr. Taylor is a senior engineer with The Babcock & Wilcox Company's Atomic Energy Division. His work on the Nuclear Ship Savannah Project started in 1956 with conceptual systems design. He was responsible for preparation of the plant operating manual and later was supervisor of the technical assistance startup group on board the ship. He has been interested in shipboard containment integrity from the first pneumatic test in 1961 to the present time. His BSME degree was received from the University of Pittsburgh in 1954.

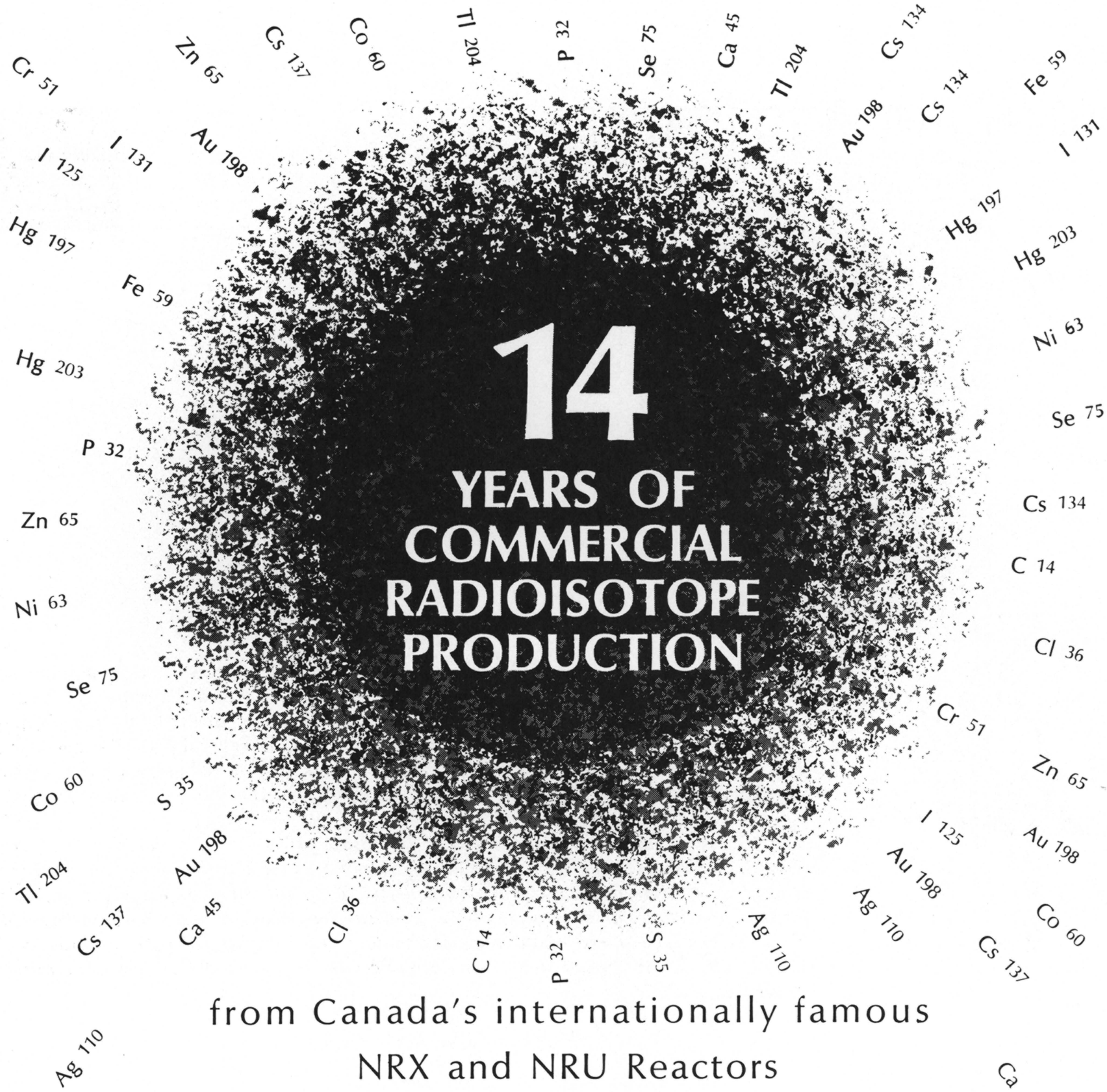




UC AND UC-PuC HEAD-END DISSOLUTION

Three head-end dissolution processes using solvent extraction to decontaminate and recover uranium and plutonium from irradiated carbide reactor fuel specimens have been evaluated on a laboratory scale at ORNL. The most promising method, pyrohydrolysis followed by dissolution of the oxide in nitric acid, gives recoveries of $>99.9\%$ and decontamination factors of $>10^4$. Less attractive alternatives were direct dissolution in nitric acid followed by partial oxidation of the resulting soluble organic species with acid permanganate or reaction of the carbides with water followed by dissolution in nitric acid.

The development of head-end dissolution processes for the carbide reactor fuels was a team project of the Oak Ridge National Laboratory, Chemical Technology Division. J. R. Flanary and J. H. Goode of the hot-cell group, assisted by G. C. Wall, guest scientist from the Australia Atomic Energy Commission, conducted process development and evaluation with irradiated, prototype fuel samples obtained by J. W. Ullmann. L. M. Ferris and M. J. Bradley of the power reactor fuel processing development group performed basic studies on the reactions of uranium carbides from which promising head-end dissolution processes evolved. Shown in the group picture are, l to r, Ullmann, Ferris, Goode, and Flanary. The young lady is M. J. Bradley; Mr. Wall is also pictured alone.



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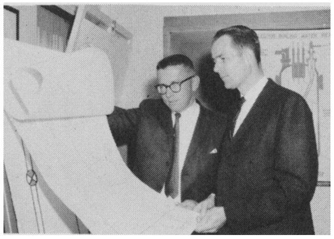
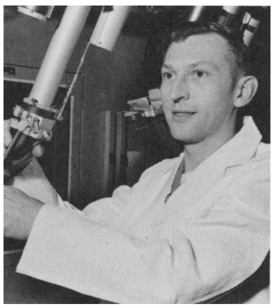


REACTOR SAFETY EVALUATION

An internal audit program for nuclear safety of the site reactors at the Vallecitos Atomic Laboratory depends heavily on the review and recommendations of an independent nuclear safety engineering organization. The program has produced unanticipated benefits in increased operating efficiency and cost savings, but does rquire a significant economic commitment on a continuing basis.

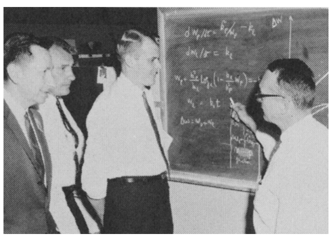
Howard J. Larson, Manager of Nuclear Safety Compliance at the Vallecitos Atomic Laboratory (VAL), is a 1953 graduate of the U. S. Naval Academy and the U. S. Navy Advanced Nuclear Power Training Program. His reactor operating and engineering experience was gained on both naval and commercial testing and power reactors. He joined VAL in 1960. Kent Stratton has been engaged in nuclear safety engineering work at VAL for five years and is currently Manager of the Technical Analysis Unit. Previously engaged in fuel development and post-irradiation evaluations at the Westinghouse Bettis Laboratory, he is a 1951 graduate in physics from the California Institute of Technology.



FABRICATION OF RADIOACTIVE SAMPLES

Samples of radioactive nuclides suitable for cross-section studies involving the fast-chopper technique are difficult to fabricate. One method is to prepare the nuclide in the form of a finely divided, chemically stable oxide, mix the oxide with aluminum powder, and compact the mixture into a solid bar. The samples are then sealed in containers for contamination control.

Julius Berreth, with the Phillips Petroleum Company's Atomic Energy Division since 1957 and in the field of nuclear chemistry for the past five years, has spent a large part of his time preparing and determining cross sections of radioisotopes. He has also be involved in the development of remotely operated equipment and techniques for fabricating radioactive powders into samples suitable for study.

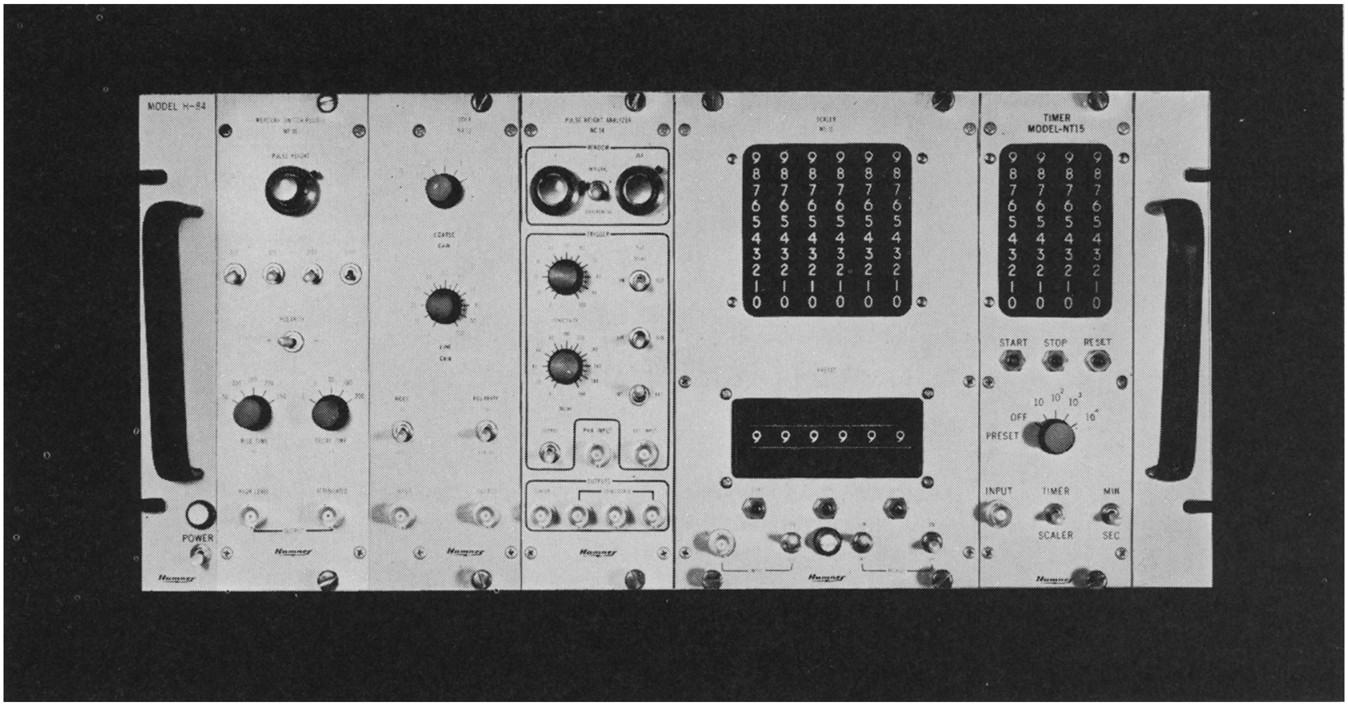


INCOLOY CORROSION IN SUPERHEATED STEAM

Incoloy-800® fuel cladding material displays good corrosion resistance up to at least 1300°F metal temperature, in heat-transfer tests conducted in an out-of-pile superheat test facility simulating the environment of a boiling-water reactor system. An initially high corrosion rate was observed, followed by a lower, constant rate within the first 1000 hours, with an insignificant amount of oxide lost to the system.

W. L. Pearl, G. G. Gaul, G. P. Wozadlo, and E. G. Brush, of General Electric Company, Atomic Power Equipment Department, are shown, l. to r., discussing corrosion rate phenomena in superheated steam. As Manager, Materials and Coolant Environment Unit, Vallecitos Atomic Laboratory, Pearl directs the applied development for establishing chemical, physical, and mechanical properties of materials associated with fuel cladding, construction, and operation of nuclear power plants. Messrs. Brush, Gaul, and Wozadlo are metallurgists in the Coolant Environment Unit involved in studying the corrosion performance of materials for application as fuel cladding in superheated-steam reactor systems.

new standard nuclear instrument modules



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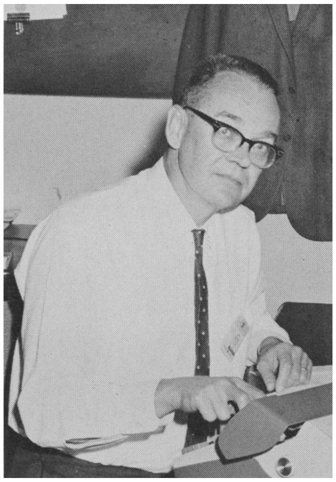
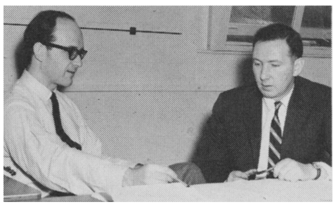


SUPERHEATED-STEAM CORROSION RATE LAW

Based on results of heat transfer tests of fuel cladding materials in superheated steam, an analytical model has been developed to yield corrosion behavior at given specified temperatures. Emphasis is placed on the transition from nonlinear to linear rate control in an examination of corrosion rate laws under superheated steam conditions. In the case of Incoloy-800®, it is postulated that the transition results in true steady-state linear control, permitting the model to be used to extrapolate corrosion behavior to long periods of time.

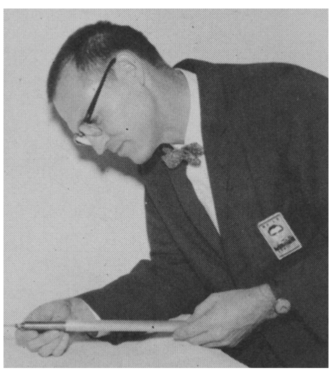
For the past three years, E. G. Brush has been studying the corrosion behavior of the iron-chromium-nickel system in high temperature steam and sodium. He obtained his B S from M I T in 1940 and, after service in the army, joined the General Electric Company in 1945. He was engaged in studies of liquid metal corrosion, the behavior of irradiated alloy fuel, and control systems while at KAPL from 1951 to 1960. Subsequently he investigated the mechanism of hydrogen transport in thin films and problems related to the hydrogen embrittlement of structural alloys.



FAILURE OF STRESSED ZIRCALOY

Failure of Zircaloy-4 and crystal bar zirconium in aqueous ferric chloride solutions is dependent on the amount of hydride present, orientation of the hydride, and time, in this proposed model. Cracks initiated at the hydride phase near the surface by dislocation pile-ups can propagate under the action of a corrosive medium resulting in eventual catastrophic failure. In all cases, intergranular failures were observed.

Drs. Thomas and Allio have collaborated on several papers on the subject of corrosion. Dr. Thomas, on the right in the photograph, is a senior engineer at the Westinghouse Atomic Power Division where he went in 1962 after several years at the Jones and Laughlin Steel Corp. Research Center. Prior to that he did graduate work at the University of Wales, U. K. Dr. Allio joined the Westinghouse Atomic Power Division in 1962 after previous positions with the USAEC and KAPL and graduate work at Rensselaer Polytechnic Institute. He presently serves as Manager, Materials and Processes Development.



OPTIMIZING REGENERATING FLUX MONITORS

Incorporating fertile material mixed with the fissile material into neutron monitors used in high flux environments can sustain the sensitivity of the monitors, if the proportion of fertile to fissile material is correctly chosen. A mathematical model for optimizing the initial composition of the regenerating material was checked by an experimental program, with good agreement between prediction and observation.

W. L. Bunch has, since 1951, been at Hanford, where his studies of the attenuation properties of concretes served as a basis for the design of several reactor shields. At the present time his field of interest is in-core neutron flux monitoring. Several patent applications have been made as a result of his efforts in these fields. He received B S and M S degrees in physics from the University of Wyoming.

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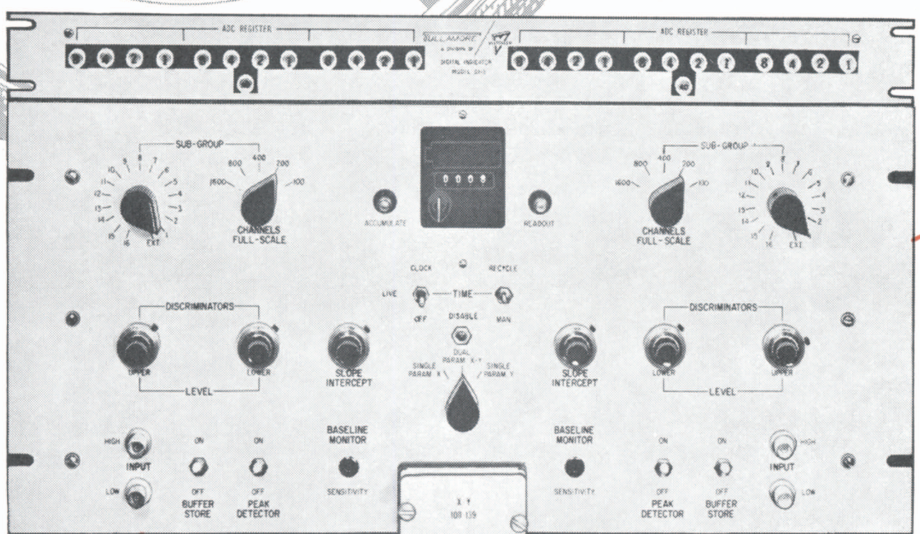

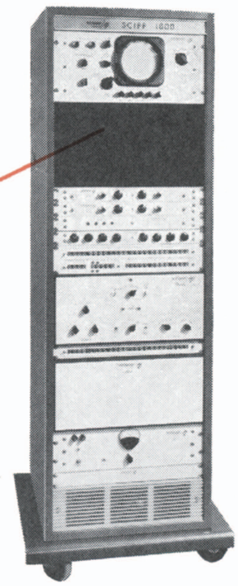

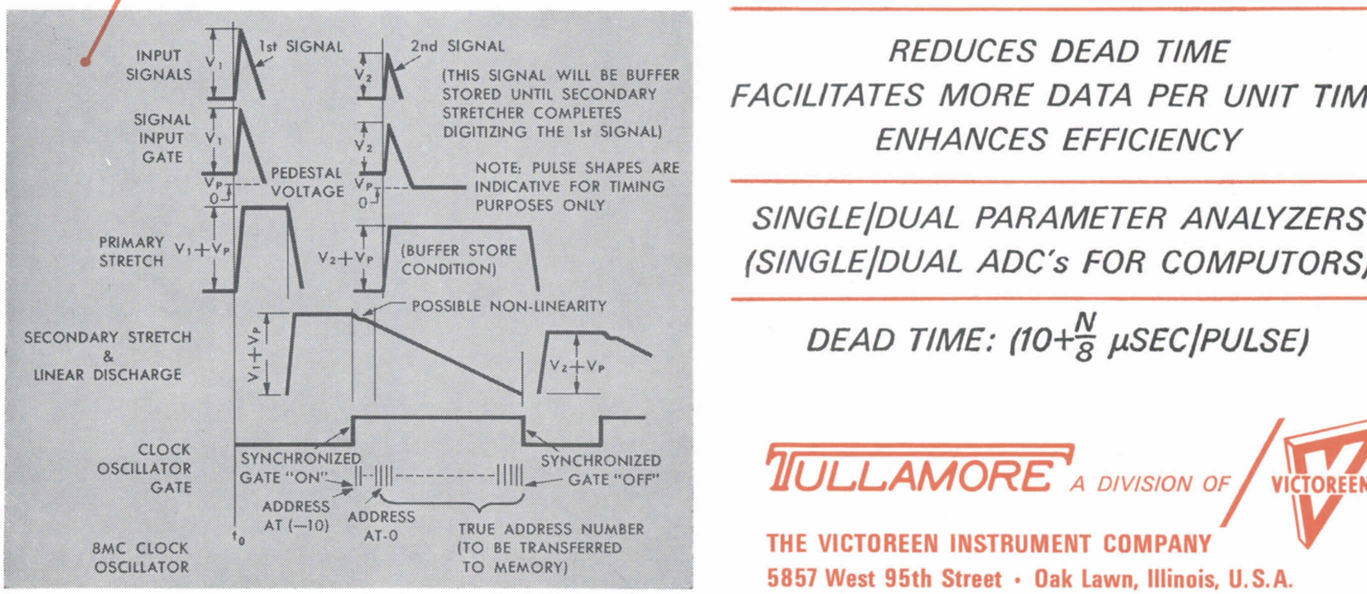

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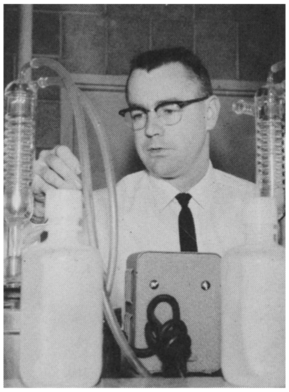
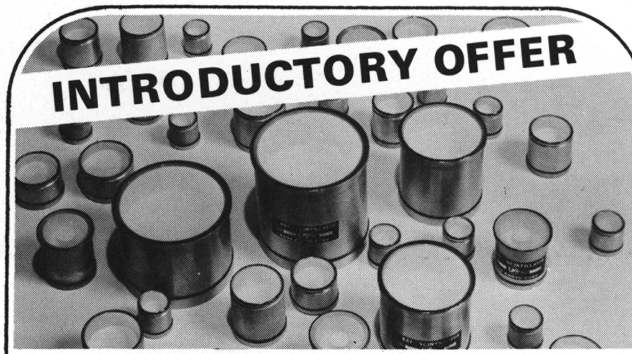
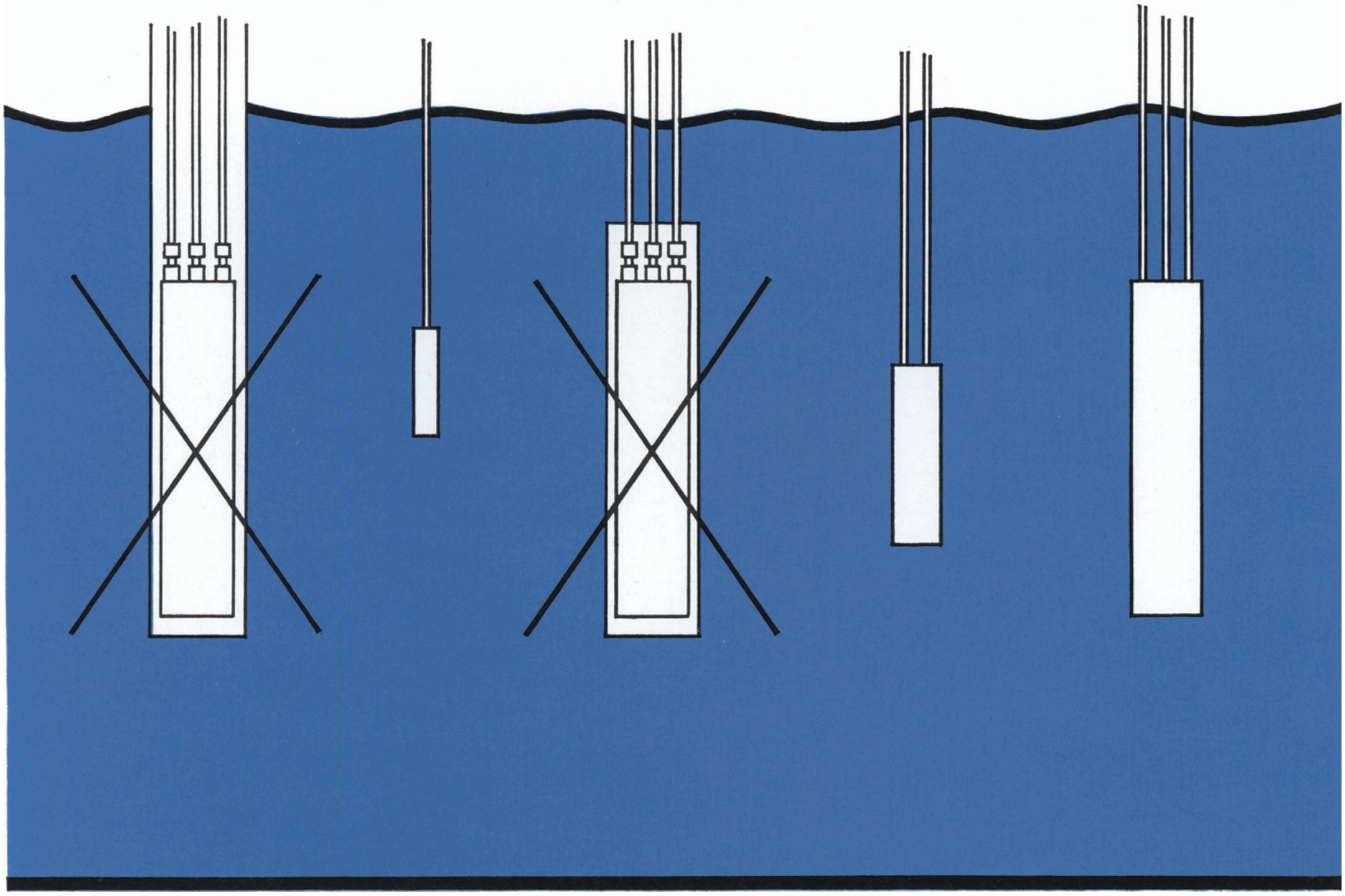


CONTINUOUS CORROSION MEASUREMENT

A Wheatstone bridge is used to determine the change in the electrical resistance of a probe inserted into a reactor fuel channel, providing a method of continuously monitoring corrosion rate in the channel. As might be expected, chemical decontamination results in significantly higher corrosion rates than does normal reactor operation, with one decontamination operation equivalent to $\approx 1\ 1/2$ months of normal reactor operation.

R. B. Richman has been engaged in development studies to improve corrosion control, decontamination, and water treatment for the Hanford Production Reactors under General Electric Co. since receiving his BS degree in Chemical Engineering from the University of Colorado in 1952. In January, 1965 he transferred, with the Hanford Laboratories, to Battelle-Northwest.





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