COMMENT AND OPINION ON THE "ORNL RADIATION INCIDENTS" AND THEIR SIGNIFICANCE

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There is an inclination to speak of the "recent radiation incidents" at the Laboratory as if they were in some manner connected, the result of the workings of some sinister influence, and that the relative gravity of the situation is directly proportional to the sum of the so-called "incidents." Actually, the incidents were related only in a general way--that is to say, better equipment is always in order, as are better procedures and more vigilant supervision. The incidents could have happened at any time, separated by intervals of years, rather than months or weeks. Factors that must be recognized are as follows: we have subjected ourselves to extremely rigorous Health Physics standards and regulations; we have been subjected to severe criticism by lay persons, including scientific personnel who have little or no familiarity with hot radioactive operations; the reports are carried in the press with the usual inaccuracy and sensationalism.

Lost sight of, I fear, is the long, successful, and safe operation of most of the hot operations at the Laboratory for almost fifteen years. My most immediate concern are the activities of the Isotopes and Operations Divisions, which have handled the most hazardous of operations with relatively modest facilities in a safe manner over this long period of time. The Isotopes Division, for example, has not contaminated any premises, ORNL or other, although shipments of radioactivity have been made for fourteen years, and this group has certainly been in the most vulnerable position in this respect of any group in the world.

Let us look at the incidents separately. An evaporator sprang a leak in the Pilot Plant and a number of curies of fission products went into the process system. The existing system could not detect it and isolate the flow fast enough, so the hold-up ponds and waste treatment plant were overtaxed and some water had to be impounded to keep below the MPC level in the river. However, the waste was handled without hurting anyone, and without exceeding the MPC level, except momentarily, in the river. This was an operating aberration which was handled successfully, even with the imperfect system available. We have always known that better monitors, more hold-up space, and a better treatment system would be desirable, and, indeed, if we had not already enlarged the process pond before this time, the problem would have been much greater. the allocation of more equipment and money to the waste disposal operating program is needed and very welcome indeed. But we did not need the incidents to demonstrate this; it has always been difficult to get money for the operating waste program--more has been spent on research than on operating!

The second incident, which was the dispersal of a maximum of 3.3 of 1-year Ru^{106} from the stack, was for the most part a nuisance rather than a dangerous situation. The operating people had no instruments to go by, the Health Physics air monitors did not pick it up, and for awhile the source of the trouble was not known. There was no significant health hazard as a result, and the event was exaggerated out of proportion. It was acknowledged that the operating procedure was inadequate; the people responsible were reprimanded and corrective measures taken. New and better monitors are being invented, but in the meantime we have put in

our own practical stack monitors. This is the first and only misoperation of this kind at the 3000 Area stack in fourteen years. It could have happened before, but the blower was shut down for the first time in six years; therefore, it happened at this time.

The plutonium explosion in 3019 was a fairly serious accident. The Pilot Plant is ancient in the atomic age time-scale and unfortunately there was a vulnerable direct connection to the outside. But we should note that the accident would have been enormously greater if filters had not been placed in the ventilating duct the year before. A few personnel received significant internal Pu doses, but none that were considered dangerous by standards in effect at the time of the incident. The surrounding area (Graphite Reactor, etc.) was cleaned at great expense down to the most rigorous standards of 30 d/min/100 cm^2 alpha smears; in many installations, areas of over 5000 d/min/100 $\overline{cm^2}$ are painted over to fix the material. At the insistence of Health Physics, even motors and door locks were taken apart for cleaning, and much valuable equipment was discarded. "Air tolerances" were essentially junked by Health Physics. The prevailing philosophy was this: if Pu exists on a surface in any measurable amount, it may become airborne, be breathed by a person and transported to his lymph nodes; the tolerance in the lymph nodes was said to be zero.

The explosion in 3019 was caused by the mixing of a proprietary chemical mixture with nitric acid. The lines should have been thoroughly rinsed with water, but as will sometimes happen, the operator failed to do it. A human error. It could have happened years ago, but the turn of events caused it to happen at this time. Better equipment, a better

plant, better procedures, and more vigilant supervision probably would have prevented it--but, it might not have; only the probability would have been reduced.

The beta skin burn on the hands of the F3P operator was the fourth occurrence. Working in a pure Ce^{144} beta field, imperfectly detected by instruments primarily designed for gamma radiation, the operator did a series of foolish operations that he knew better than to do. It was the midnight shift, the minds were dulled, the foreman had more to do than he could cope with, and this chain of events resulted in the first detectable radiation damage in the fourteen years of Isotope work. The burn was mild and not widespread, but resulted in more furor than if the operator had been killed or his arm cut off in a more ordinary manner. The foreman was reprimanded, the operator should have been fired, but could not be, for various reasons. Procedures have been tightened up to help prevent a recurrence.

At this point, let us look at the record of the Isotopes group, for example. This group has worked for almost fifteen years with hot radiochemistry of the kind described as "looking-it-in-the-teeth" (contrasted with Hanford and Savannah's push-button techniques in multi-billion dollar plants), handling over 10,000,000 curies of assorted radioactivities to ship out 1,000,000 curies in finished products. Out of 10,000,000,000,000 curie-man-hours, there have been about 15% of the men with more than the allowable average of 5 rem/year. In all of these cases, the extra dosage was accumulated in the years when the allowable exposure was 500 r/week instead of 100 r/week. No one has gotten a really dangerous dose, external or internal, if we use previously accepted standards. In fact, so far as we know up to now, nobody has

been seriously injured in any way, radiation or otherwise. It is for this reason that supervisors in these operations look with dismay at the censure now displayed and ask: "Where do we go from here? We can make a few mistakes! Are we being required to guarantee absolutely no radiation disturbances of any kind?"

The most recent incident at the Solid State Hot Laboratory is probably mainly the result of defective basic design (hot laboratories in a big office building), inadequate cell ventilation, and inadequate operating procedures. This is the first disturbance of this magnitude at these cells, and why it should have occurred at this particular time, we of course will never know. However, there is no obvious connection between this and the previous incidents.

Besides being bad logic, the connecting of these incidents into a series is a bad thing for ORNL; every effort should be made to have these occurrences viewed separately. It is true that better design, better equipment, and better supervision would have been helpful. The need for more segregated operation, better procedures, and better Health Physics instrumentation and coverage has long been recognized. However, many of these things increase operating costs and are understandably hard to get approved and financed. When criticism is levelled at the hot operations of the Laboratory, these facts should be kept in mind.

The last matter to which I should like to refer is the replacement of line organization by staff committee organizations. In my view, the inevitable endpoint of this method is complete collapse of a vital part of Oak Ridge National Laboratory, namely, the hot work, and destruction of the remaining esprit de corps in one of our most valuable assets--the old, experienced, hot radiochemists, radioengineers and radiosupervisors.

All nuclear research, engineering, calculations, metallurgy, biochemistry, and health physics research are for naught if it is not practical to do hot operations, for in that case there will be no really important nuclear industry. Oak Ridge National Laboratory is located in this isolated Oak Ridge federal government area primarily to do hot work that can't be done in ordinary places. If we cannot do hot work at ORNL, most of our reason for existence is gone, since the cold work can be done anywhere.

Oak Ridge National Laboratory was founded and built upon hot radiochemical work, and it should not be abandoned lightly.

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