

CORRESPONDENCE
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The problem of liquid and gaseous effluent disposal at Windscale †

by

Frank Reginald Farmer, B.A.

Correspondence

Mr Kyrle W. Willans (Consulting Engineer) observed that much of his working life had been connected with sea fishing and he confined his remarks to the possibility of discharge of effluent affecting that vital industry.

138. The civil engineer had much to answer for in regard to pollution of rivers, estuaries, and sea-coasts by discharge of sewage.

139. The mechanical engineer and shipowner by the introduction, development, and reckless discharge of oil was responsible for surface pollution of the seas, and pollution was probably increasing in the proportion to the square of the number of ships in commission using liquid fuel.

140. Mr Willans had no doubt that in disposal of sewage and oil, any misgivings were quelled by the experts maintaining that everything was satisfactory.

141. Was there data on why fish left areas where they had previously been plentiful? The reason was lack of food but what caused that lack? Why was the Loch Fyne herring little more than a name and what had caused the drop in numbers of whiting and haddock in Loch Linnhe?

142. Seeping of tar and motor oil from roads reduced the quantity and quality of river fish not by actual damage to the fish but by destruction of their food, mainly insect life.

143. How could it be asserted that the presence of quantities of radioactive agencies, too minute to inflict harm, would not cause fish to leave grounds on which they massed, either because the radioactive effluent made their food unpalatable, or caused a "feel" in the water that the fish did not like.

144. There was no reference in the Paper to increase, decrease, or change in nature of plankton.

145. The science of nuclear physics admittedly was so new that no one could speak with authority on discharge of radioactive effluent to the sea; it was not so much a question of the harm done by discharge of effluent from Windscale but the future harm in seas surrounding the British Isles as nuclear power stations multiplied.

146. In a recent account of progress in connexion with the Wantage Radiation Laboratory it was stated, "Harwell scientists are fighting against time to find uses for the waste products before vast quantities become available in three years' time". The wording of the article was very disquieting, but even more serious was a statement that a scientist from the fisheries laboratory at Lowestoft had not been allowed to give his opinion on discharge of effluent from the proposed Atomic Research Station in Dorset.

† Proc. Instn Civ. Engrs, vol. 6, p. 21 (Jan. 1957).

147. Mr Willans could not help countering the calm assurance of the nuclear scientist that no harm would be done to sea food from discharge of effluent into the seas, with the harm already done by wholesale discharge below the surface of sewage and industrial effluents and on the surface by the equally lavish discharge of waste oil.

148. Whilst acknowledging the consummate ability of the nuclear scientist in development of nuclear energy such scientists normally had single-track minds; Mr Willans questioned their ability to lay down the law regarding the effect of their effluents on sea life.

The Author, in reply, said that Mr Willans had made a number of important points relevant to the discharge of radioactivity at sea. Such discharge might be considered first, from its effect as a chemical and secondly, from its effect as a radioactive material.

150. The chemical toxicity of a number of substances was well established although admittedly their effects in open sea and around the shores of the United Kingdom were not so easily determined, and were at present the subject of considerable investigation on the part of research organizations in many countries. However, the discharge of radioactive wastes were extremely small in terms of their chemical effect and the maximum concentration of any radioactive chemical discharged from Windscale in the sea-life observed around that site amounted to only one part in 10^{14} (one part in one hundred million million by weight). Normally chemical toxicities became important at a few parts in a million or thereabouts.

151. The introduction of radioactivity into the sea did not present a new problem for the sea contained natural radioactivity with which all sea-life had existed from the beginning. The radioactivity from potassium amounted to one curie in six hundred million gallons, and the activity from that source in seaweeds around British coasts amounted to 10^{-10} c/g.

152. As a result of the discharge of radioactivity the sea-life in the immediate vicinity of such discharge would accumulate more radioactivity, but not of a magnitude substantially different from the activity already present, so that no new effect could be anticipated from that cause.

153. In § 145, Mr Willans referred to the increase in discharges which might take place as power stations multiplied. The radioactivity discharged from any power station would be extremely small compared with that which had already been discharged from Windscale and many thousands of power stations could be built without, by themselves, increasing the activity discharged around British coasts to any extent.

154. The discharge of activity would largely be associated with chemical plants and not power stations, but it followed that the throughput of those chemical plants would increase as power stations multiplied. The discharge from those chemical sites would not increase in the same proportion as new techniques were evolved for chemical processing and certainly no great change in the present state was anticipated over the next 10-20 years.

155. § 146 referred to the use to which waste radioactivity by-products might be put in years to come. The processing of waste nuclear fuel made available tens of millions of curies per year, and scientists were rightly looking for uses to which that might be put. The study was not directly connected with the discharge of radioactivity to the sea, but that discharge represented only a very small fraction of that figure.

156. The law with respect to the discharge of radioactive waste was not formulated by nuclear scientists. Nuclear scientists assisted in providing data on which those parties interested in the preservation of fish and sea-life would make an authorization limiting the amount of radioactivity which might be discharged to sea.

157. The Atomic Energy Authority were bound by authorizations from the Ministry of Housing and Local Government and the Ministry of Agriculture and Fisheries. The latter Ministry had laboratories at Lowestoft and were in a position to use the result of experimental analysis and the opinions of their scientists employed there before granting authorizations to the Authority.