general data

The DIDO Rabbit Network is a pneumatically operated system with pipelines linking an inpile element in DIDO Reactor with three Radio Chemistry laboratories in Buildings 220, 10.18 and 148. The laboratory in Building 148 is also linked to an inpile element in BEPO.

The main advantages of such a system are:—

(a) Speed of transport of sample between the reactor and laboratory.

(b) The irradiation is under the control of the scientist in the laboratory.

The extent of the network is shown in the diagram, and it can be seen that there are two pipelines to DIDO, which terminate separately in a common inpile element. Samples can be sent to DIDO through either pipeline from any of the three laboratories, and the design of the network control circuits is such that both services to DIDO, DIDO I and DIDO II, and the route, Building 148 to BEPO may be used simultaneously and independently of each other. This flexibility is achieved by the installation of five distribution stations (or points) which are sited in Hangar 10.

The DIDO Engineer Central Officer (E.C.O.), has complete administrative control of the network, and he is responsible for setting up any route required from a control console situated adjacent to DIDO control room. Also the DIDO and BEPO E.C.O.'s can at all times exercise an over-riding control on the movement of samples being sent to, or received from their respective reactors. They can also reject samples from "inpile" under all foreseeable conditions.

The sample which is to be irradiated is put into a sample container which is inserted into a carrier. The carrier is then loaded into the rabbit pipeline through a loading port at the laboratory send/receive station, and is despatched to the appropriate reactor by the scientist pressing a button marked "send", the rabbit being propelled by air at low pressure. Route lights mounted on the control panel in the laboratory and the control console in DIDO indicate the progress of the rabbit, along the pipeline. Prior to entering the reactor it is arranged that the sample container automatically separates from the carrier at a transfer station, the sample container proceeding on into the reactor. When the sample container reaches the end of the inpile element rabbit tube, its presence is monitored by measuring the pressure drop across the container, and this pressure drop actuates a switch which illuminates lamps at the send/receive station and DIDO control panel, which indicate that the sample has arrived inpile. At the end of the irradiation period the user operates a "receive" button and the container, propelled by air, leaves the inpile element, and automatically collects the carrier which is waiting at the transfer station. The complete rabbit then returns to the laboratory from which it was despatched. Route lights are again illuminated to show the progress of the rabbit since they were extinguished after indicating the progress of the rabbit to the reactor when the container arrived in-pile.

Upon entering the send/receive station, the container separates from the carrier in a simplified version of the transfer station; the sample container proceeding on into a shielded receiving box, or to remote handling equipment located in suitable shielding.

The time taken for samples to reach the various laboratories from DIDO are:—

Hangar 10·18	..	5 minutes
Building 220	..	5½ minutes
Building 148	..	6½ minutes

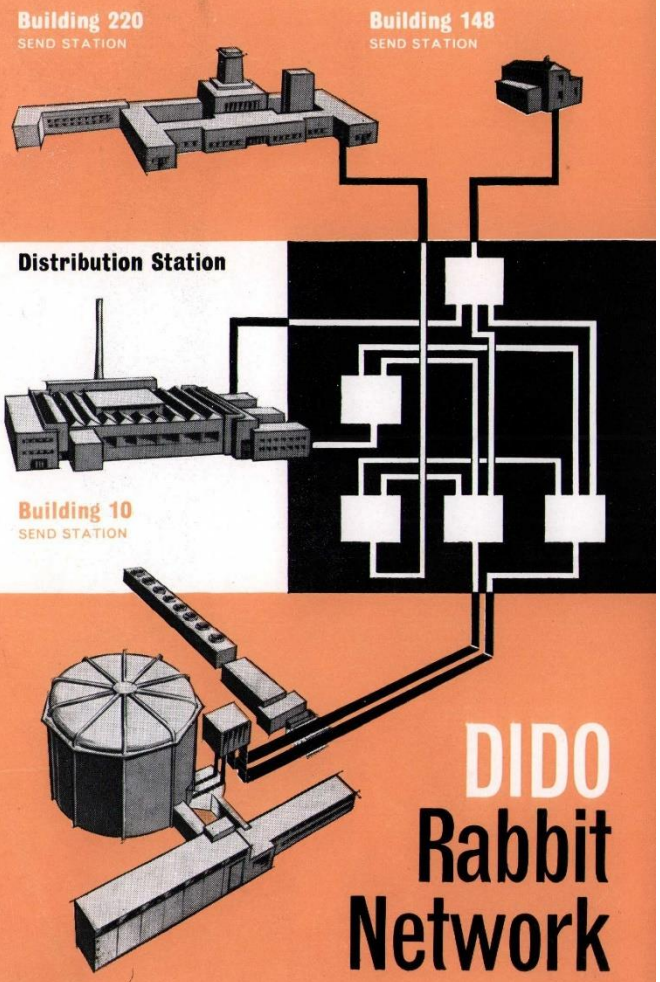
From BEPO to Building 148 the time taken is 1½ minutes. (average rabbit velocity 18-20 ft/sec.)

The rabbit pipelines are in the main 3 inch I.D. copper pipe, and are buried below ground level between the various buildings. Since the temperature of these pipes is of the order of 5°C, all air which propels the rabbit is dried by absorption type driers to a dew point well below this figure to prevent condensation occurring in the pipelines. To detect for possible leaks of surface water into the pipelines between DIDO and Hangar 10, a continuous purge of dry air is passed down each pipeline from DIDO site to Hangar 10 where it is monitored for increase in humidity due to pick up of water which may have entered the pipes. The pipeline from Building 148 to Hangar 10 runs in service ducts and is not prone to surface water leaks. That part of the pipeline between the transfer station and inpile element in which the container travels without a carrier is made from stainless steel.

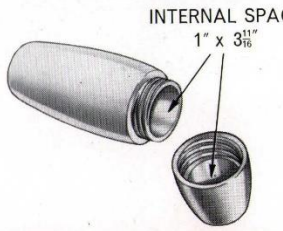
Those parts of the pipelines which run above ground, mainly in buildings and in which a stoppage of an active rabbit would constitute a hazard to personnel working in the area, are monitored by gamma monitors which give a local alarm. In the DIDO area the monitors also initiate a warning in DIDO control room which also indicates the area of the stoppage.

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

LEAFLET No. 305606

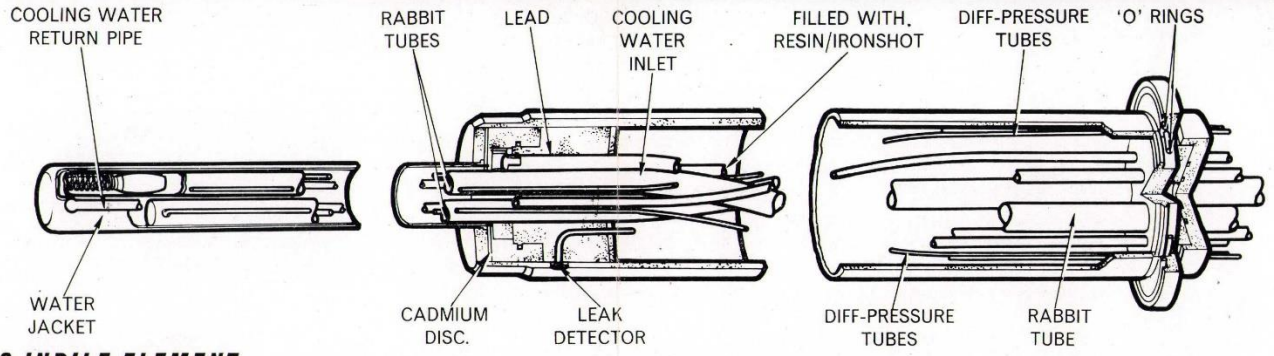


DIDO Rabbit Network



SAMPLE CONTAINER

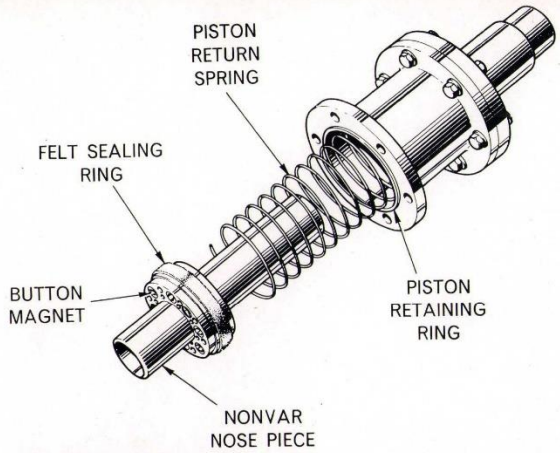
Considerable research has been undertaken to find a container material which will satisfy all the conditions imposed by a network and irradiation facility of this nature, and the material which appears to be most suitable at the present time if an Epoxy resin strengthened with terylene fibre. This material has a finite irradiation life and present indications are that irradiation times in the order of 6 hours are possible with a heat source dissipating 15 watts inside the container. This time limit may be extended after further tests have been carried out.



DIDO INPILE ELEMENT

As mentioned previously, the inpile element contains both rabbit tubes, each tube having an associated return air and d.p monitoring tubes. All tubes are housed in a "D" shaped water jacket, the cooling water thus being in direct contact with the outside of the rabbit tubes. The facility is installed in the 4H6 thimble on face 10 of DIDO. The shield plug follows conventional pattern which includes an aluminium outer shell through which the service tubes are spiralled, the void space being filled with resin iron shot shield materials. A buffer plate, mounted on an inconel spring, absorbs the energy of the rabbit when it reaches the fully inpile position. Two probe-type leak detectors are fitted to monitor for leakage of cooling water into the thimble. Other leak detectors in the rabbit tubes just outside the element monitor for leakage of cooling water into the rabbit pipelines.

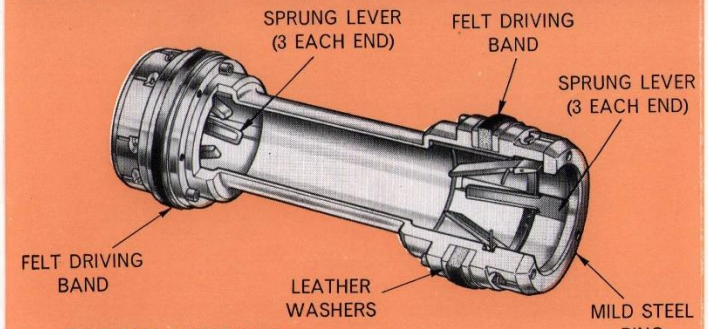
The inpile lengths of DIDO I and II differ by 6 inches and the approximate thermal neutron fluxes are DIDO I $1{\cdot}5\times10^{13}$ n/cm.^{2}/sec.—DIDO II $3{\cdot}0\times10^{13}$ n/cm.^{2}sec.



TRANSFER STATIONS

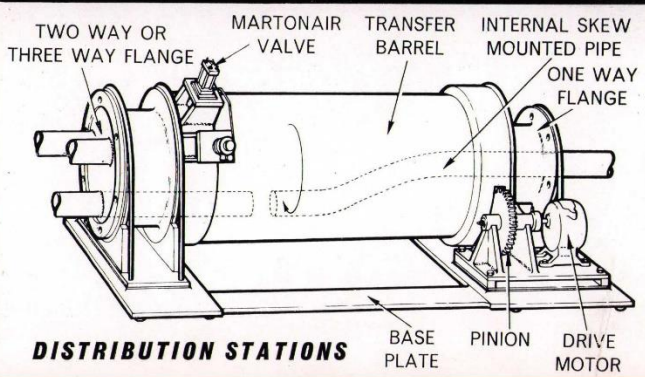
The transfer stations are basically air damped pistons which arrest the carrier, a hole through the centre of the piston allows the container to continue on into the reactor. Attached to the piston is a tubular nose piece which enters the carrier when it reaches the transfer station, opening the spring loaded arms and thus releasing the container.

All sliding surfaces of the piston assembly employ hard felt washers in order to absorb any small particles of dirt which could jam the piston, and also to provide the correct degree of sealing for the air damping of the piston.



RABBIT CARRIER

The carrier is essentially an aluminium alloy tube, the container being held in position by spring loaded lever arms at each end of the carrier. The carrier is symmetrical and the container can be inserted from either end. Also the carrier can be placed either way round into the pipeline. A mild steel ring is attached to each end of the carrier and this locates on button magnets recessed into the face of the transfer station piston, this arrangement ensures that the carrier does not move out of position whilst waiting at the transfer station.



DISTRIBUTION STATIONS

The distribution stations consist of a drum, the periphery of which revolves on roller bearings. The drum is revolved by a small a.c. motor. The inlet to the drum is from the centre at one end. A length of rabbit pipe is mounted internally in the drum and this length of pipe is "skewed" and can locate with either two or three openings at the opposite end. These openings are spaced around a circle concentric with the drum and connect via sealing rings to fixed pipes. Rotation of the drum through 180° or 120° therefore enables the rabbit to be diverted to one of either two or three ways depending on the type of distribution station. The drum is locked in the required position after the drum has rotated to the desired point.