PICKFORD, HOLLAND & CO., LTD.

Producers of refractory materials. 391 Fulwood Road, Sheffield S10 3GB. Telephone 0742 303921 (10 lines). Telex 54426
Registered Office Registered in England, No. 128414 VAT Reg. No. 172 3715 52

AJN/MT

8th July, 1980.

Air Products & Chemicals Inc.,
Escambia Plant,
P.O.Box 467,
Pensacola,
Florida 32592,
U.S.A.

Dear Sirs,

Re: Proposed use of PH/NUA21 Catalyst in your Methanol Plant Reformer

We confirm that Pickford Holland & Co.Ltd. will accept the return, of all normal radioactive waste (contaminated coveralls, radicactive dust, used catalyst etc.) which arise during the loading/unloading of our PH/NUA21 catalyst, to the United Kingdom for disposal at an approved dumping site within the United Kingdom. All costs to be borne by client.

The regulation packing requirements and current disposal costs are outlined in the attached publication.

Yours faithfully,
for PICKFORD HOLLAND & CO. LTD.

A.J.NORMAN
Technical Sales Manager, Catalyst Dept.

Encs.

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Disposal of used NUA21 plus other radioactive waste.

1. Regulations

The regulations for shipping used NUA21 are as strict as those for shipping new catalyst and must be fully complied with. The requirements are as follows.

The catalyst must be loaded in good, rust free steel drums conforming to the International Atomic Energy Authority (IATA) Transport Regulations for Type 'A' packages.

In our experience the thickness of the steel including the lid should be not less than 0.048 inches (1.2mm). The catalyst should be packed inside a polythene liner inside the drum or in a number of smaller polythene bags. The radiation requirements are that the dose rate measurable on the outside of the steel drums ( $\gamma$ radiation) must not exceed 0.5mRem/hour and the removable surface contamination on the drums must be less than $10^{-3} \mu Ci/cm^2$.

To reduce transport costs the catalyst should be packed in drums of optimum size 23 inches dia (58.5 cms) by 33.1/2 inches high (85 cms). Four drums should be strapped on a wooden pallet, size 44 x 44 inches (112 x 112 cms), which will fit side by side in container vessels.

2. Method of disposal.

Pickford Holland have an arrangement with British Nuclear Fuels Ltd. for the disposal of spent NUA21 plus other radioactive waste arising from the charging and discharging of the catalyst in a Client's reformer tubes. The arrangements call for the following instructions to be carried out.

Upon arrival at a U.K. port, the containers holding the spent NUA21 plus waste material must be unloaded for onward transmission via road transport to Pickford Holland works at West Hunwick, Co.Durham. A BNFL Inspector will inspect the drums at Pickford Holland works.

continued.....

Disposal of used NUA21 plus other radioactive waste (cont'd).

After acceptance for dumping, the spent catalyst plus waste material will be taken by a special BNFL lorry from Pickford Holland works to the approved dumping site.

3. Cost of disposal.

(a) Provision of polythene bags, drums and pallets; Client's liability.

(b) Transport from Client's site to FOB port of Client's choice; Client's liability.

(c) Shipping costs from port of Client's choice to U.K.port; Client's liability.

(d) Unloading from containers on to road lorries and transport to West Bunwick; £60.00 per tonne.

(e) Inspection at West Bunwick and transport to dumping site; £19.625 per tonne.

(f) Dumping charge; £12.25 per tonne.

Sub Total £41.375 per tonne.

(g) Pickford Holland handling charge; £150 or 10% of the subtotal, whichever is the greater.

Pickford Holland have no control over the prices shown in items (d), (e) and (f) which are therefore given without guarantee.

# PRECAUTIONS TO BE TAKEN WHEN STORING, HANDLING AND USING NICKEL URANIUM STEAM REFORMING CATALYSTS

by

M.D. Hill and A.D. Wrixon

Pickford, Holland and Co.Ltd.
Contract No. 6/1017

National Radiological Protection Board
Harwell,
Didcot,
Oxon.
Ox11 ORQ

June, 1975

Abstract

This report has been prepared by the National Radiological Protection Board for Pickford, Holland and Co. Ltd. The potential hazards associated with the use of nickel uranium steam reforming catalysts, which are slightly radioactive, have been assessed in the light of the recommendations of the International Commission on Radiological Protection. It is concluded that these catalysts can be used safely provided some simple industrial hygiene procedures are followed. The most important of these procedures are the wearing of gloves when handling the catalyst and the use of techniques to reduce dust levels when loading and unloading reformer tubes. Special medical supervision of workers should not be necessary.

Nickel uranium steam reforming catalysts contain depleted uranium which is slightly radioactive. However, the hazards associated with this material are negligible if simple precautions are taken to ensure good industrial hygiene. The catalysts consist of uranium oxide, nickel oxide and a small amount of barium, supported on alumina. The main problem arising from their use is due to the dust produced during handling, and most of the precautions are therefore directed at reducing dust levels and hence intakes of dust.

## 2. RADIOLOGICAL PROTECTION DATA

### 2.1 Properties of Depleted Uranium

Naturally occurring uranium consists of three isotopes: uranium-238 (99.3%), uranium-235 (0.7%) and uranium-234 (0.006%). Depleted uranium has a lower activity than natural uranium since part of the uranium-235 (and some of the uranium-234) has been artificially removed, typically depleted uranium contains 0.3% uranium-235.

All three isotopes of uranium emit $\alpha$-radiation and produce daughter isotopes which are also radioactive, emitting $\alpha$, $\beta$ and $\gamma$ -radiation. These three types of radiation will therefore be emitted by depleted uranium catalysts.

Alpha-radiation has a very short range and is stopped by, for example a few centimetres of air or the dead layer of the skin. External to the body it therefore presents no hazard but internally it is the radiation of principal concern. Since the catalyst is in insoluble form the organs of the body chiefly affected by eating or breathing in the catalyst will be the gastro-intestinal tract and the lung respectively. Beta-radiation has a somewhat longer range and if the catalyst is handled directly this can cause external irradiation of the skin and hands. However, any normal form of containment of the catalyst will eliminate this since, for example, 1.4 mm of steel is sufficient to completely stop the radiation.

Gamma-radiation is much more penetrating than $\alpha$ or $\beta$ -radiation but the intensity decreases rapidly with distance. In view of its penetrating nature it can cause irradiation of the whole body and is the only radiation of interest when the catalyst is contained in storage drums or reformer tubes.

### 2.2 Basic Standards

The basic standards of radiological protection are those of the International Commission on Radiological Protection, ICRP, who have laid down maximum permissible levels of radiation exposure[1]. These levels have been accepted internationally and those which are relevant to this assessment are given in Table 1.