

*Restricted*

**GERMAN OIL STORAGE, BLENDING, AND  
FILLING INSTALLATIONS**

**REPORTS**

ON

**W.I.F.O. Oil Storage Depots**

LOCATED AT

**EICKELOH, RÜTHEN**

AND

**NIENBURG**

**WITH PARTICULAR REFERENCE TO DRUM AND CAN FILLING**

SEPTEMBER, 1945

**BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE**

**32, Bryanston Square, London, W.1**

R E S T R I C T E D

GERMAN OIL STORAGE, BLENDING AND FILLING  
INSTALLATIONS

Reports By

C.A. HARRISON

and

E. LAIDLAW

or

W.I.F.O. OIL STORAGE DEPOTS LOCATED AT

E I C K E L O H, R Ü T H E N

A N D N I E N B U R G

WITH PARTICULAR REFERENCE TO DRUM AND  
CAN FILLING

SEPTEMBER, 1945.

BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE,  
32, Bryanston Square, London, W.1.

TABLE OF CONTENTS

	<u>Page No</u>
<u>INTRODUCTORY REPORT</u>	
Object of Visit	2
Personnel	2
Duration of Visit	2
Reports	2
Conclusions	3
<u>REPORT I. W.I.F.O. Oil Storage Depot,</u> <u>EICKELOH</u>	
I Jerrican Filling Installation	4
II Ventilation	6
III Hygiene	6
IV Fire Fighting	6
V Drum Filling Installation	7
VI Lubricating Oil Filling Installation	7
General	7
<u>REPORT II W.I.F.O. Oil Storage Depot,</u> <u>RÜTHEN</u>	
I Jerrican Filling Installation	9
II Drum Filling Installation	10
General	10
<u>REPORT III W.I.F.O. Oil Storage Depot,</u> <u>NIENBURG</u>	
I Aviation Spirit Barrel Filling Installation	12
II Aviation Spirit Bulk Filling Installation	14

## I N T R O D U C T O R Y   R E P O R T

### Object of the Visit

The object of the visit was to investigate the design and operation of Filling Installations at selected W.I.F.O. Oil Storage Depots in Germany so as to determine what special precautions if any, had been taken to ensure safe working conditions for the men engaged in the operation of filling volatile petroleum products of high lead content into small containers.

### Personnel

The team was composed as follows:-

Mr. C. A. Harrison.   British.   Ministry of Fuel & Power.  
Mr. E. Laidlaw         "                 "                 "                 "                 "

### Duration of Visit

The above members left London on September 2nd, 1945 and reported at Bad Oyenhäusen to the B.I.O.S. Administrative Officer the same day, before proceeding to Löhne which remained the headquarters for the duration of the visit. The investigation was concluded and the members returned to London on September 9th, 1945.

### Reports

Three selected W.I.F.O. Oil Storage Blending and Filling Installations were investigated and the information obtained is given in a separate report for each depot:-

- Report 1. Eickeloh.
- "     2. Rütten.
- "     3. Nienburg.

## Conclusions

No experience of conditions giving rise to cases of lead poisoning amongst workmen engaged in filling leaded petroleum products into small containers was reported to have occurred at any of the W.I.F.O. Installations visited.

Aviation spirit having a high lead content viz. 5.5 ccs per gallon which might have given rise to anxiety under certain conditions was mainly handled in bulk, with a limited amount of drum filling, but was never filled into small containers as practised in this country and abroad.

Motor Spirit of comparatively low lead content was filled into 20 litre Jerricans. The filling installations for this duty had been specially designed with the object of providing safe working conditions for the men operating in a confined building under black-out conditions. While the arrangements for this purpose were, in general, well planned and designed, the ventilation provided had not proved entirely adequate in practice and it was reported that operators had complained of the effect of gasoline exposure in the automatic machine filling room.

Based on experience in this country and abroad, it is considered that additional safeguards to protect the health of the operators would have been required at all the filling installations visited in order to make them suitable for filling high lead content petroleum products into small containers.

14th September, 1945.

R E P O R T N O . I

E I C K E L O H

W. I. F. O. Oil Storage, Blending and Filling Installation  
(Motor Spirit Drum and Can Filling Section:)

Introduction

This is a bulk underground storage installation with facilities for leading Motor Spirit and filling this product into drums, Jerricans and rail tank cars and for filling lubricating oils, gas oil and Diesel oils into drums and rail tank cars.

I. Jerrican Filling Installation

The filling plant is installed in an enclosed brick and concrete building specially designed and laid out for the continuous filling of Jerricans with Motor Spirit. The plan of the building follows the sequence of operations and is as follows:-

- (a) Receiving Section for empty cans.
- (b) Automatic Filling Machine room.
- (c) Receiving Room for full cans.  
Note:- The cans are closed in the filling room and sealed in the receiving room.
- (d) Outloading Section for full cans.
- (e) Drum Filling Annex.

The operation of Jerrican filling is as follows:-

An endless conveyor, specially designed for the carriage of Jerricans, connects all sections. Empty Jerricans are received from an unloading platform into the building and are placed by hand on the conveyor which feeds them through the filling machine and thence via the capping, sealing and inspection section to the unloading point where the full Jerricans are loaded on to electric trolleys and sent to the despatch section.

The Automatic Filling Machine is of a continuous rotary type, having 24 filling nozzles and a filling rate of 1,000 to 1,200 Jerricans per hour. The machine is rotated through the movement of the

conveyor. The oil to be filled is led into a tank fitted to the upper part of the machine and the level of oil in the tank is controlled by a float valve on the petrol supply line to the machine. Jerricans are filled by volume namely, 20 litres, from vertical cylindrical metal containers, one for each of the 24 filling points. The measuring cylinders are filled through cam-actuated valves connected to the upper supply tank.

Empty Jerricans are carried by the conveyor into the machine and are thrust and centered under the filling nozzles by means of a spring-loaded buffer. In this operation the neck of the filling cap moves against a spring loaded mechanism which opens the filling valve so allowing the oil to flow from the measuring cylinder through a projecting nozzle into the Jerrican. After filling is completed a period for draining is allowed, and the valve is then closed by a cam device. The filling valve incorporates the following special features -

- (a) A Vapour Return Pipe, shrouding the filling nozzle and connecting to a central pipe common to the 24 filling points which returns to the main supply tank or alternatively vents to atmosphere. (See Rüthen Report)
- (b) An Anti-drip Device consisting of a brass plate which slides over and closes the outlet of the filling nozzle after filling is completed and the filling valve has shut.

Finally full cans are released from their position under the nozzles by a cam operated ejector pad and the caps of the Jerrican closures are closed by hand. The Jerricans are then carried by the conveyor into the inspection and sealing room where is located a 5½ H.P. variable speed electric motor driving the conveyor and filling machine. The Filling Machine and Conveyor are manufactured by JAGENBURG WERKE A.G., DÜSSELDORF. Full sets of the drawings were taken away from Eickeloh by Major Smallwood R.E., on 3/5/45 and a covering receipt is

held by Herr Koch the present civilian Manager. No other drawings of the filling machine are available at the plant.

## II. Ventilation.

The whole building has forced draft ventilation and the Jerrican filling room, in addition, has suction ventilation through an extraction fan. Air is supplied through vents in a metal ducting at the roof level. In the filling room, air is drawn by the extraction fan via ducting led to below floor level and to the centre of the machine. The extraction fan capacity is designed to give 10 to 15 changes of air per hour in the filling room and the discharge vent is led to atmosphere at a point remote from the forced draft fan suction. The fan motors are rated at 5 H.P. and the capacity of the extraction fan is estimated at 1750 m<sup>3</sup> or 62,000 cu.ft. per hour.

## III. Hygiene.

The filling room walls are tiled with white glazed tiles to a height of about 5 ft. and the floor has red tiles with checker plates over those sections giving access to the drainage facilities and interconnecting pipes. The other rooms in the building were finished with concrete floors and rough concrete surface on the walls. No washing or changing room facilities were incorporated as part of the filling installation but there are general facilities including mess rooms provided in a building near the entrance gate. Information was given by the management that no special precautions had been found necessary to protect the workers in the filling room from contact with the leaded spirit and vapours and no cases of sickness associated with lead poisoning had been reported.

## IV. Fire Fighting

The building and equipment were protected by a CO<sub>2</sub> installation which operated by means of fusible plugs and could also be brought into action by remote control.



## V. Drum Filling Installation

A separate section of the building, fitted with sliding doors so as to leave one side fully open, was used for drum filling and housed 4 filling points, having a simple hand-operated filling nozzle for visual filling. No weighing machines were provided. Forced draft ventilation was supplied at floor level but there was no extraction ventilation. Compared with the facilities and layout of the can filling section, the drum filling section was decidedly poor. However, drum filling facilities for spirit were also available in the large open sided, naturally ventilated lubricating oil filling shed where were installed equipment and arrangements for filling by weight on 12 x 500 kilogram weighing machines, manufactured by BIZERBA Waagenfabriek, Wilhelm Kraut, BALINGEN, Wüttemberg.

## VI. Lubricating Oil Filling

- (a) Drums:-- Lubricating Oil was normally filled by weight in the naturally ventilated wooden filling shed, already described above.
- (b) Bottles:-- The filling of lubricating oil into bottles out in a well designed concrete building ventilated by forced draft through ducting and fitted throughout with flame-proof electrical equipment. The one litre carton "bottle" filling machine, manufactured by JAGENBURG-WERKE, DÜSSELDORF, had a capacity of 1,000 to 1,200 bottles per hour. Bottles are filled, capped and sealed in pairs and are fed into the machine and carried to a packing room by means of an endless conveyor. The filling room was tiled throughout and was maintained in spotless condition.

## General (Additional Plants)

- (a) Ethyl Blending Plant - conventional standard design and calls for no comments.
- (b) Lubricating Oil Plant
- (c) Barrel and Jerrican Cleaning and Painting Plant.
- (d) Combined Stand-by Generator and Boiler House.

The above plants were outstanding in respect of well-planned layout, superior equipment and fittings, excellent forced draft and extraction ventilation and fire-fighting facilities and the excellent state of maintenance.

13th September, 1945.

REPORT NO. 2

R U T H E N

W.I.F.O. Oil Storage, Blending and Filling Installation  
(Motor Spirit Drum and Can Filling Section)

Introduction

This is a W.I.F.O. Oil Installation for handling motor spirit, lubricating oil, gas oil and Diesel oils with facilities for the storage and filling of Glycol into containers. The plant is similar throughout to that inspected at Eickeloh. The following additional points in connection with can and drum filling practice, however, are particularly mentioned.

I. Jerrican Filling Installation

This installation comprises the standard W.I.F.O. continuous rotary automatic filling machine already described in the report on Eickeloh. Information was given that when filling leaded motor spirit, working conditions in the filling room had not always proved entirely tolerable to the operatives. This was particularly so when second hand Jerricans were filled as the damaged cans could not receive the full volume of oil from the measuring cylinders of the machine with the result that considerable spillage took place. From their experience the management were of the opinion that the filling machine room was too small and the ventilating facilities inadequate for the duty of filling motor spirit. Under best conditions of filling new cans it was stated that some filling room operators could only remain on duty for 2 hours at a time, but the average was 6 hours. However no cases of sickness had been reported and there was no evidence to suspect any lead poisoning. Medical examinations of workmen engaged in filling had never been made.

In view of the above reported difficulties and in order to achieve a higher filling rate to meet demands, the Installation Management had found it necessary to bring back into operation eight (8) volume type hand operated filling machines, originally installed in 1939 before the automatic machine was available. These volume type machines were arranged in pairs, installed under a roof canopy, each pair set out to feed full cans into a rail wagon over roller gravity conveyor.

Each machine comprised 10 interconnected volume measuring compartments, of 20 litres capacity which filled in succession. A sight glass on the last compartment showed when the supply valve was to be closed. A hand operated lever controlled all 10 filling valves and nozzles through a common link motion, so enabling 10 Jerricans to be filled simultaneously. It was reported that spillage was negligible, working conditions in respect of noxious vapours excellent due to the very open arrangement of the layout and that a filling rate of 2,500 Jerricans per 8 hours shift per machine could be achieved, compared with a maximum of 1,200 Jerricans per hour on the automatic machine. Drawings of the automatic machine were asked for but once again they were not available and in this case it was stated that they had been destroyed by the foreign workers.

## II. Drum Filling Installation

Filling of Motor Spirit into drums in the Annex of the automatic Jerrican Filling Installation had not proved satisfactory on the four weighing machines, due to the congested layout in the limited space available, to which reference has already been made in the report on the Eickeloh installation.

Motor Spirit drums were therefore filled preferably nearby under open air roof canopies where connections for filling lubricating oil and Diesel oil were also installed. No complaint concerning noxious vapours had been reported when filling motor spirit into drums, but the open nature of the outside drum filling points had proved very arduous to the workmen under the rigorous winter conditions.

### General (Additional Plants)

- (a) Lubricating Oil Filling.

The drum filling and one litre bottle filling machines were identical in layout and capacity to those reported on at Eickeloh.

- (b) Ethyl Blending Plant  
(c) Standby Generator and Boiler House

} These plants were identical in design and layout to those already described at Eickeloh.

(d) Barrel and Jerrican  
Cleaning and Painting  
Plant.

This plant was identical in design and layout to that at Eickeloh but, in addition, the drying ovens for the repainted drums and Jerricans had been erected and were examined. These ovens were designed to dry by means of hot air, heated by steam coils, but this section of the equipment was not installed.

(e) Benzine Blending  
Pump House.

The installation, which is under ground, comprises three pumps and three horizontal cylindrical tanks, which were allocated to Benzine, Benzol and Gas oil respectively. The pumphouse is ventilated by forced draft and extraction fans but no special precautions have been provided to remove leakage at pump glands etc., which would certainly give rise to a hazardous condition if spirits having a high lead content were to be handled through these pumps. An interesting feature of the pumphouse, with respect to operation, was the orifice operated proportioning device manufactured by ASKANIA, BAMBERGER WERKE A.G., Berlin-Friedenau, designed to control the proportions of the two components in the blend by the remote operation of the discharge valves on the delivery of the two centrifugal blending pumps. The pumping units were manufactured by NAEHER, Chemnitz, fitted with A.E.G. electric motors.

13th September, 1945.

R E P O R T   N O . 3

N I E N B U R G (Schäferhof)

W.I.F.O. Oil Storage, Blending and Filling Installation  
(Aviation Bulk and Drum Filling Section)

Introduction

This is a large bulk underground storage installation with facilities for leading Aviation Spirit and filling this product as well as lubricating oils, gas oil and Diesel oils into drums and rail tank cars. Since Motor Spirit was not stocked as at Eickeloh and Rütten no Jerrican filling facilities had been installed.

I. Aviation Spirit Barrel Filling Installation

The filling installation is conventional in design comprising an enclosed wooden shed with fixed glass windows and wooden double doors, approximately 30' x 12', with concrete floor, flameproof electric light fittings and flameproof telephone. Natural ventilation of the building was through the doors only and heating was by simple steam radiator pipes, fitted with a steam trap.

The filling equipment comprises four filling heads, supplied by pump from the main header through individual valves and quick action hand release trip valves - Type AUTOSTOP D.R.W.Z., - manufactured by TUBOFLEX A.G. HAMBURG, - controlling the flow of spirit to drums through an extensible brass filling nozzle projecting into the filling hole. The spirit supply passes through a filter fitted to the main in the filling shed.

Filling is by weight on 500 kilogram scales, set in the floor and manufactured by BIZERBA Waagenfabriek, Wilhelm Kraut, Komm. Ges., BALINGEN, Württemberg: dials by August Sauter, EBINGEN, Württemberg.

Adequate earthing arrangements by clip and wire were fitted at each filling point.

II. Aviation Spirit: Bulk Filling Installation at Rail-head  
(15 Filling Points)

The installation is of conventional overhead rack design and offers no special features except an elaborate form of aluminium filling head designed to fit with a gas-tight joint into the manhole of rail tank cars. The filling head comprises a gas-tight manlid incorporating a filling nozzle or tube fitted with a quick action shut-off valve, actuated by a float, controlled by the level of oil in the rail tank car. A vapour return connection in the manlid is made through flexible kerbside pump hose to a main pipe leading back to the storage tank. The whole unit is carried on a jib and is lifted into place by a small hand-operated winch fastened to the oil riser pipe from which a flexible 4" armoured hose connects into the manlid.

The manufacturers of the manlid assembly, known under the patent name of "Universal Mannlöckdeckel, Type Gasometer", are WILKE-WERKE A.G., Braunschweig.

13th September, 1945.