

Philips Valve Works, Hamburg, including  
Studiengesellschaft, Stellingen and subsidiary  
factory at Hornoburg

C. H. Müller A.G., Hamburg

EXTRACT FROM FINAL REPORT NO. 65

The first plant was visited on the 20th August, 1945, and the second on August 22nd to 24th inclusive, and the last on the 25th August, 1945.

At Valve Works at Hamburg, the principal personnel interrogated were P. Rittersberger (Acting Director in place of Dr. G. Jobst who had been suspended by Philips), G. Oertel, P. Gogl and O. Saalman, the last named acting as interpreter.

At C. H. Müller, Dr. Fehr and Mr. Weigel were interrogated.

Philips Valve Werke G.m.b.H.

1. General

The factory is situated at Hamburg-Lokstedt 1, Stresemannallee 101, and consists of two large two storey buildings together with a number of smaller buildings such as stores and mechanical workshops, and an administrative block, giving a total area of 32,000 square metres. The factory was twice bombed, once in July, 1943, and again in June, 1944, but the damage sustained in these raids had been completely repaired and the buildings were in good order. In addition to the main factory at Lokstedt, Philips had made use of the small leather factory situated in the village of Horneburg, some fifteen miles or so from Hamburg on the other side of the Elbe and a small assembly unit had been installed in the Hotel Zur Haake in the village of Hausbruck about half way between Hamburg and Horneburg. The main features of the factory organisation are shown in Appendix I.

2. Types of Valve Manufacture

Until the middle of 1943, the manufacture of valves for domestic purposes continued on a diminishing scale. From 1939 the production of Wehrmacht valves grew, slowly at first and increasing more rapidly after 1943. The principal types of Wehrmacht valves which were made were:-

RV 2 p 800; RV 12 P 4000; HV 2,4 P 700; RV 12 P 2000;  
HL 2 T 2; PL 12 T 2; HL 12 P 10; HL 12 T 15; HL 2 P 3;  
RL 12 P 50; RL 12 P 35; LS 50; RK 12 SS 1; RK 12 SS 2;

3. Factory Equipment

Most of the equipment in the factory was dismantled and disorganised. The factory had been visited a little while earlier by an R.A.F. Disarmament Section who had issued instructions that all Wehrmacht equipment was to be segregated for removal. The firm had interpreted this instruction to mean that they were to segregate all plant which had been used for the manufacture of Wehrmacht valve types with the result that most of the factory equipment was crowded together in considerable disorder in one part of the factory. Generally speaking, the equipment at Hamburg was the same or older than that at Minden. The equipment of greatest interest was as follows:-

Grid Lathes

The lathes at Hamburg were the same as those seen at Minden and are heavy machines about 11 ft. long, capable of producing strips of grids up to about 4 ft. 6 in. long. The winding head which is quite massive can operate up to a speed of 600 r.p.m. and carries a large hollow centre helix wire spool centrally, and in front of the nicking

and swaging rollers. The support wires are pulled through the head from large spools at the end of the machine. The winding noses are of tungsten carbide and are reputed to last three or four months. The support wires are pulled by a carriage which is driven by a  $\frac{1}{2}$ " diameter lead screw which is, in turn, driven by a train of gears from the head. A large cam on the tail end of the back shaft enables variable pitch, close end turns or open gap turns to be produced.

#### Heater Spiraling Machines

A number of gapping spiraling machines of Bruckner manufacture were seen which were of two types, one for heavy wire coils and the other for light wire coils. These machines possessed novel features and were extremely well made. No machines of this type are in existence in the U.K. and arrangements were made for four of them to be moved from the factory and sent to Farnborough.

#### 1.4 Organisation and Manufacturing Methods

Appendix I given in tabular form, the annual production figures and number of employees and a graph is also given which shows the monthly production rates and number of employees for the last two years of the War. At first sight, the efficiency of production appears to have dropped away badly during the War but a number of factors must not be overlooked. The air raid in 1943 closed the factory down for two months and it was not until early in 1944 that the rate of production had been built up to its proper value again.

Shortly after this condition had been reached, the second air raid took place and, although its effect on production was not so serious as the first, it was not until the latter half of 1944 that the production rate reached its normal value once again. Although the direct effect of the air raids, in terms of building and equipment damage, was relatively small, the indirect effects were fairly serious. Supplies of gas, electricity and water were interrupted and there was a steady loss of labour due to damage to their homes and other reasons.

In 1943, the manufacture of valves for domestic purposes ceased and the Weilmacht types, the production of which was stepped up, were certainly more difficult to make than the domestic types. It will be seen that in 1939 a very large proportion of the output was rectifier valves, i.e. types which were relatively simple to make.

The monthly average production in 1939 was round about 275,000 valves per month and the highest monthly average reached subsequently was about 280,000 valves per month early in 1945. Thus the same monthly output was achieved in spite of the difficulties due to air raids etc. and the manufacture of more complicated valves, with a labour force between two and three times as large.

The curve showing the average direct labour force shows a marked upward trend after the second air raid in 1944 and it is safe to assume that a fair proportion of the extra operators were comparatively unskilled. This was confirmed by the factory management who stated that on the Valve Type F700, which was made at a rate of up to 60,000 per month and was one of the two largest production types, it was necessary to use sixty assemblers and thirty-eight girls on subsequent operations up to and including test, to achieve a rate of 300 per hour pumped.

The rejection rate on this type was about 24% of which faults, due to air leaks caused by bad copper clad wire, accounted for a 10% shrinkage rate.

The operators were paid on the Beddoes System and, in normal times, there is a two years' general training for girl operators who are taken on at the age of fifteen. The girls who had been trained on this system were used as charge hands, etc. during the War.



2. Laboratory For Electronic Research

This laboratory was situated at Vogt Kolln St. 30, Stollingen and covered the development and pre-production activities for the main valve works at Leckstedt. For certain types of valves, where the production requirement was very limited, all the valves required would be made in the laboratory. This applied to the small Argo filled AG.50 and the Helium filled EC.50. The EFF.51 was also being made in the small quantity at the laboratory.

When the supply of pressed glass bases from the Philips Glass Works at Weiswasser failed, due to the occupation of that part of Germany by the Russians, the laboratory attempted to develop the manufacture of equivalent bases from coarse glass powder. The intention was to melt this powder with the pins in position, in carbon moulds, using Eddy current heating.

The experiment was not very successful but, with the end of the War in sight, it was never carried to conclusion.

The plant in these laboratories was of an extremely good quality and considerable expense seems to have been incurred in equipping them. The buildings had twice been damaged by air raids but had been rebuilt and, when seen, were in very good order. From the technical point of view, none of the apparatus was of outstanding interest.

3. C. H. Muller, A.C., Hamburg

Dr. Ritz was formerly Director of this X-Ray Tube Factory but had been discharged by the British Military Government as being a prominent member of the Nazi Party. His place had been taken by a Dr. Fehr who answered all enquiries with the assistance of Weigel, the Works Manager.

Before the War, the factory operated with about 500 people producing X-Ray Tubes and high voltage and X-ray apparatus for Diagnostic and Therapy purposes. During the War, their production increased from 5,000 to 8,000 tubes and valves per year but no appreciable production of new types was undertaken. What new developments there were, centred chiefly in the production of a 160 kv Rotalix tube in hard glass with oil immersed operation and a 100 kv tube of similar characteristics, but this development accounted for only 10% of the total production.

In 1943, the firm started the development and manufacture of high voltage Generators for Nuclear Physics work. This apparatus provided up to  $1\frac{1}{2}$  to 2 million volts for cyclotrons and two or three of these had been delivered to various Universities. This side of Muller's work had already been investigated by U.S.A. and British experts.

From a valve point of view, there was not a great deal of interest in this target. The methods used for making large glass to metal seals was seen in operation and was interesting. The materials used are either chrome iron in conjunction with Osram OO lead glass, Fernico in conjunction with Philips G40 glass, or silver was Osram 424 D glass.

Prior to filling, the edge of the Fernico is beaded with special "Fernico Wrapping Glass". When making the seals, a glass lathe of normal type is used. The chrome iron has no special treatment apart from degreasing and is brought up to a temperature estimated at  $1,000^{\circ}\text{C}$ . At this temperature, glass from a rod is run on the inside and outside of the edge to a length of 2 to 3 mm. and is made about 1 mm. thick. The edge of the chrome iron is then kept at about  $700^{\circ}\text{C}$  until the glass tube part is ready to be joined on. The joint is made, worked by moving backwards and forwards, and blown as required. The strain is then spread with a large fierce flame and the joint annealed with a big soft luminous flame. The process for making a joint about  $2\frac{1}{2}$ " in diameter, which was observed, took about five minutes including setting up and annealing.

The factory was accommodated in a four storey building of modern design with approximately 70,000 sq. ft. of floor space. Next to it was the administrative building and the entire plant was completely undamaged.

On the instructions of the British Military Government, manufacture of X-Ray tubes and auxiliary apparatus had been recommenced in August, to relieve the acute shortage of this type of equipment which exists in Germany today.

Philips Valvo Werke G.m.b.H., Hamburg  
Annual Production 1939-1942

Year	Broadcast Valves		Cathode Ray Tubes	Amplifying Valves	Wehrmacht Types			Regulating and Stabilising Valves	Operators (average)
	Receiving	Rectified			Receiving	Transmitting	C.R.T.		
1939	1,938,684	1,387,293	2,998	3,114	346,399	-	-	17,254	1,628
1940	1,037,038	449,850	4,829	5,412	673,036	-	-	11,295	1,544
1941	884,674	102,251	6,108	-	714,063	-	-	21,194	1,435
1942	651,866	87,133	14,207	-	812,252	40	84	30,267	1,409
1943	195,855	48,644	15,547	-	1,092,412	5,671	3,170	16,554	1,690
1944	-	-	19,459	-	2,116,498	32,020	4,532	7,846	2,608
* 1945	-	-	2,123	-	736,465	9,862	3,188	2,294	3,468

✓ Production ceased in July.

\* January - April.