Judge Anderson

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Carbide Metal Works

Report of Operations

Business Year 1939/40

(signature): Ammann

Table of Contents.

	Page
A. Utilization of plant	3
B. Movement of personnel	8
C. Production	9
D. Products, deliveries	11
E. Stocks	13
F. New installations, developments	15
G. Actual costs	23
H. Receipts of plant	25
Appendix: Branch operations	28
Enclosures	30

(page 3 of original)

A. Utilization of plant.

Hard metal plant facilities have been expanded over a number of years in the expectation that the application of hard metals has not reached its limit and that it would increase particularly during a war. How correct and necessary this completion of facilities was, has been shown by the report year. In the course of war preparations the orders increased extraordinarily. The production facilities for carbides were, however, able to cope with the requirements to such an extent that the greatly increased German demands were fully satisfied and the necessary export secured.

(graphic representation of the production of Widia Metal, 1937-1940) :

Our position in the field of carbides remains therefore supreme. The production of Widia Metal, of mixtures for the "Special Manufacture", etc., rose from 632,644.6 kg last year to 952,368.9 kg in the report year, i.e., by 50.5 % or by 133.5 % as compared with 1937/38 (Fig. 1). 594,468.3 kg were produced of "Special Products" as compared with 382,736.3 kg last year, i.e., a plus of 55.3 % or of 190.8 % compared with 1937/8 (Fig. 2). The tool shop produced 401,603 tools as compared with 308,893 tools last year, i.e., an increase of 30 % or of 94.1% compared with 1937/8 (Fig. 3). The unrestricted supply of hard metal led to a steadily increasing back-log of orders since the beginning of the war, so that the delivery periods for hard metals which had had been some 4 weeks prior to the war, now rose to four or five months. Since the increase in orders was largely attributable to sales for hoarding,

(page 4 of original)

according to our knowledge of consumption conditions, we persuaded the Reich Office for Iron and Steel to issue a regulation governing priorities for hard metal to become effective in March 1940; the regulation achieved its purposes of securing adequate and early supply to the hard-metal consumers and of eliminating hoarding. The number of orders received in the last months of the report year show that the output of the carbide works was able to meet the needs of the armament economy.

TRANSLATION OF DOCUMENT No. NIK-13122
CONTINUED

(page 4 of original, cont'd)

In order to secure the supply of hard metal for the German processing industries in every eventuality, a normal production plant for hard metal will be set up by order of the High Command of the Wehrmacht as a reserve plant within a portion of the Wuppertal special works. Preparations in this direction are already underway, and are being expedited so that operations can begin in a few months if necessary. We hope to find sufficient use for these facilities after the end of the war as well.

The carbide research laboratory of the Studien-Gesellschaft fuer elektrische Beleuchtung m.b.H., Berlin, reorganized and expanded with our technical and financial support, furnished us with 7,988 kg of carbide metal in the course of the report year and has hereby contributed to the expected extent to the operation of our plant.

The high capacity operation of the expanded plant during the report year, was, however, only possible because we had an adequate supply of raw material. Owing to our foresight in the disposal of our stocks over a number of years, we had, at the beginning of the war, considerable supplies of raw materials on hand, and were equal to all demands; in recognition of the supreme importance of carbides for the armament industry, particularly for the manufacture of ammunition, the Reich Office for Iron and Steel put at our disposal such quantities of tungsten, etc., that our stocks were used only little.

(page 5 of original)

A - I. Normal Carbide Production (Widia operation)

a) At the beginning of the report year the facilities for the production of Widia Metal had been increased to the anticipated maximum output of 12,000 kg monthly. This capacity could not be fully utilized, however, in spite of overtime and Sunday work; the removal of trained male personnel, for military service and the increased allocation of entirely untrained female personnel, plus the interruptions caused by air-raid alarms necessarily resulted in a reduction of output. Under these circumstances, the utilization of the maximum output capacity of the plant to the extent of 95.8 % as an annual average, must be considered to be creditable. The capacity and utilization are shown in figure 4.

(Here follows graph No. 4)

b) The capacity of the installation for the production of mixtures for specialised manufacture which amounted to 45,000 kg monthly at the beginning of the report year, was again raised in response to steadily growing demands. It reached 90,000 kg monthly at the end of the report year. Figure 5 shows capacity and utilization.

(Here follows graph No. 5)

(page 6 of original)

A - 2. Speciality Manufacture Essen. (Turning Shop Essen).

The completion of the new building for the Essen Turning Shop was delayed by difficulties resulting from the war and especially by the hard winter; consequently the special manufacturing operations still had to be performed in the inadequate premises of the main factory. Figure 6 shows the capacity and utilization of the plant. The rise in output by weight since the middle of the report year can be attributed primarily to the adaptation of operations to the production of larger points.

(Here follows graph No. 6 showing capacity and utilization of plant).

A - 3. Speciality Manufacture Bremen (Turning Shop Bremen.

The rise in output owing to the additional machinery installed and to a series of organizational measures, as listed in the previous report on operations, was attained in the first months of the report year. The high output already attained in this period was considerably above the normal output of the plant, and was only made possible by the over exertions of all personnel. Utilization of plant and capacity are shown on figure 7. The drop in utilization of plant during May and June is the result of the adaptation of operations to the production of larger points.

(Here follows graph No. 7 on capacity and utilization of plant).

A - 4. Speciality Manufacture Wuppertal (Turning Shop - Wuppertal.)

On 2 June 1940 the Wuppertal turning shop began the final processing on one of a total of six conveyor bands provided. With the advancement towards full-scale operations, which were attained at about 50 % by the end of the report year, the output also increased, as shown in figure 8.

(page 7 of original, cont'd)

(Here follows graph No. 8)

A - 5. Tool Production (Vidia Tool Shops).

Through the removal of the Vidia tool shops into a new building of about 4,000 qm usable floor space, of which approximately 2,000 qm are for machinery, the output capacity was raised from 30,000 tools per month to 40,000 tools per month following the installation of new machinery. Notwithstanding this expansion, the back-log of orders

EXPLANATION OF DOCUMENT No. NIK-13122
CONTINUED

(page 7 of original, cont'd)

continued to rise. Figure 9 shows the output capacity and utilization of plant.

(Here follows graph 9)

(page 8 of original)

B. Movement of Personnel.

Carbide operations	30 Sept. 1938	30 Sept. 1939	to the army	30 Sept. 1940	to the army
Workers, male	908	1258	129	1402	159
Workers, female	653	997	--	961	--
Employees	96	128	13	187	16
Executive officials	9	13	--	16	--
Totals:	1666	2396	142	2566	175

Distribution of the 2566 complement is as follows:

B - 1. Widia operations	735
B - 2. Turning Shop Essen	152
B - 3. Turning Shop Bremen	966
B - 4. Turning Shop Wuppertal	301
B - 5. Widia Tool Shop	314
B - 6. Quality Inspection (Qualitaetsstelle) and Administration	98

Details of personnel changes are shown in enclosure 1, page 30, and enclosure 2, page 31.

(Here follows a graph showing personnel change).

(page 9 of original)

C. Production.

C - 1. Normal Carbide Production.

I. Production of finished hard metal tips amounts to:

Tungsten-carbide alloy	1938/39 kg	1939/40 kg	% increase
with titanium	43 373.4	76 864.0	77
without titanium	44 884.7	53 532.1	19
Totals:	88 258.1	130 396.1	48

(page 9 of original, cont'd)

Tungsten-carbide alloy	1938/39 kg	1939/40 kg	% increase
	Number of tips.		
with titanium	2 457 513	4 157 132	69
without titanium	2 823 757	3 341 901	18
Totals:	5 281 270	7 499 033	42
Average weight of tips	16,7 g	17,4 g	see enclosure 3, page 32.

The strong upswing in production is based exclusively upon the increased use of widia; as a matter of fact, the German production of ingot steel fell somewhat during the same period. In 1939 the production of a ton of ingot steel in Germany required 4,4 g hard metal, but in the first 9 months of 1940 it was 7,6 g.

II. Primary material produced:

Mixtures for:	1938/39 kg	1939/40 kg	% increase
Special Manufacture	486,085.9	725,936.8	49.3
Foreign branches and licensees	9,659.0	12,528.0	29.7
Totals:	495,744.9	738,464.8	49.0

(page 10 of original)

III. Of welding alloys and drill tips for deep drilling a total of 14,662.2 kg were produced as compared with 8,990.8 kg in the previous year, i.e., an increased output of 63.1 %.

IV. 7,777.3 kg balls for grinding were produced as compared to 1,341.4 kg last year.

V. The increased stock of intermediate products amounted to 61,068.5 kg, or 35.8 %, as of 30 September 1939.

(page 10 of original, cont'd)

For an outline of production relative to I, II, III, IV and V, see enclosure 4, page 33, and enclosure 5, page 34.

C - 2. Speciality Manufacture Essen.

Production rose from 54,682.5 kg last year to 120,810.0 kg in the report year, that is, by 110.9 %.

(See also enclosure 6, page 35).

C - 3. Speciality Manufacture Bremen.

Production rose from 328,053.8 kg last year to 413,217.5 kg in the report year, that is, by 26.0 %. The higher production is chiefly the result of the production of points of larger dimensions. (See also enclosure 6, page 35).

C - 4. Speciality Manufacture Wuppertal.

Production amounted to 60,440.8 kg. (See also enclosure 6, page 35).

C - 5. Tool Shop.

401,603 tools were produced in the report year compared to 308,893 last year, i.e. an increase of 30 %. (See also enclosure 7, page 36).

(page 11 of original)

D - 1. Normal Carbide Production.

The following was produced and delivered:

I. Seventeen hard metal alloys for the various applications, distribution of which is made according to main user groups, qualities and Krupp shops, and shown in enclosures 8, page 37, 9, page 38, 10, page 39, 11, pages 40-42, and 12, page 43.

Enclosure 13, page 44, shows the progress of deliveries of non-titanium carbides, for which patent protection ceases in 1941, and of titanium carbides, for which patent protection will continue until 1949.

Our most important alloys and their application are shown in the following table:

(page 11 of original, cont'd)

	Present Widia Quality	Previous Widia-Quality	How and where used.
For the finishing of steels of all kinds and steel castings.	S 1	XX	For high cutting speeds and small chip cross-sections.
	S 2	Y 8	For medium cutting speeds and medium chip cross-sections, as also for interrupted cuts.
	S 3	S 58	For low and medium cutting speeds and large chip cross-sections, specially for sharply interrupted cuts and greatly varying depths of cut.
	F 1	S 246	Precision-drilling and finishing.
For the machining of other materials	G 1	N	Machining of cast iron, copper alloys, light metals synthetic and plastic materials.
	G 2	G	Machining of synthetic and hard wood, fibrous material, various plastics, and for hammer-drills.
	H 1	H	Machining of chilled castings, cast iron of more than 200 Brinell, cast iron with hard spots in the outer layer, malleable cast iron, glass, porcelain, stones.
	H 2	H 167	Special chilled castings (e.g. nickel-alloy chilled castings) of more than 100 shore.

(page 12 of original)

Noteworthy among hard metal deliveries is the considerably higher proportion of qualities containing titanium carbides. Last year the proportion was 49.1 %, in the report year it rose to 56.6 %. The deliveries of hard metals containing titanium carbides, amounting to 70.750 kg, was 75.9 % higher than during 1938/39.

(page 12 of original, cont'd)

This considerable increase in the use of titanium carbides results from armaments which particularly require the machining of large quantities of high-tensile steel and steel castings. It is necessary therefore to expect a considerable drop in the demand for titanium carbide after the end of the war.

II.a) Mixture ready for pressing for Special Manufacture in Essen, Bremen and Wuppertal.

b) Mixture ready for pressing for foreign branches in Italy and Hungary, also for licensees.

III.a) Welding alloys and drill tips for underground drilling.

b) Balls for grinding for own use.

Survey relative to II.a) and b) and III.a) and b), see enclosure 14, page 45.

D - 2. Speciality Manufacture Essen.

Points of various sizes. (Enclosure 15, page 46).

D - 3. Speciality Manufacture Bremen.

Points of various sizes. (Enclosure 15, page 46).

D - 4. Speciality Manufacture Wuppertal.

(Page 12a of original) (Enclosure 15, page 46).

D - 5. Tool Shop.

The toolshop made 269,550 finished normal and special tools and 22,624 pure Widia tools and jobs, and 109,429 pieces of tools sent in by customers were tipped with Widia. Of the finished tools, 107,671 pieces, or 40 %, were for mining, and 30,309 pieces, or 11.2 % were supplied to Krupp plants. (Enclosure 16, page 47, and enclosure 17, page 48).

During the report year the tool shop drew 8,826,2 kg hard metal from the Widia plant for the production of tools. The importance of the tool shop is well indicated by this figure; it is higher than the entire turnover of Widia in 1932 and during the report year it amounted to 13.9 % of our direct domestic turnover (i.e., without licensees) in tool tips. The returns on products alone - including the GU share - amount to RM 660,000 in round figures during

(page 12a of original, cont'd)

the report year, on which no taxes have to be paid to Aske, etc. since the production of tools and the further processing of Widia Metal is an exclusive Krupp undertaking. Since the German processing industry is forced to draw more and more finished tools owing to overload, without the tool manufacture a considerable quantity of the carbides now being processed by the tool shop would be delivered to the users not directly, but by our licensees; apart from the loss of the tool shops, own profits, this would lead to a corresponding profit reduction in hard metal production.

The close co-operation between the Widia plant and the tool shop could lead to continuous improvement both of tools of perfect quality and of the technical methods for carbide tool production; so that confidence in the use of carbide tools and the scope of their use could be enlarged.

(page 12 b of original)

In numerous instances, moreover, the tool department has promoted progress in machining methods by its willingness to produce special carbide tools which even special tool makers did not want to produce because of the risk involved.

Mining is another field in which we were only able to make headway through our own tool factory. In the report year alone tool manufacture consumed 4,660 kg hard metal for mining tools. It is true that earnings on mining tools are relatively small, but in own manufacture of mining tools it is possible to obtain some of the required hard metal from waste accumulated in tool manufacture during the production of normal qualities since this waste is unsuitable for the latter; thus, on the one hand, we have a profitable use for this waste, and, on the other hand, we are able to deliver the mining tools at prices acceptable to the mining industry.

Formerly, we actually curtailed the development of our tool production out of consideration for German tool makers; we did not want to compete with them. The success of our tool production, however, showed that some expansion of the production program was possible without harming the other German tool factories, and, moreover, that this was necessary both in our own interests and in the interests of the increased use of hard metals. Appropriate measures were therefore taken; for further details see F - 5, on page 22.

TRANSLATION OF DOCUMENT No. NIK - 13 122
CONTINUED

(page 13 of original)

E. S t o c k s .

E.-1. Normal Hard Metal Production

	30 Sep.1938 RM	30 Sep 1939 RM	30 Sep 1940 RM
Stocks :	3 675 601	5 273 519	6 768 858

Under the Tungsten quota of 1 January 1940 we have been allotted the quantity we actually require every month so that we still have at our disposal the large stocks which we had prior to the quota system. The rise in value is due to an increase in the stocks of intermediate products at the expense of raw materials. The over-all picture of our stocks is favorable. Considering that the competent authorities recognise the importance of sufficient supplies of hard metal forthe German processing industries we expect that we shall be allotted a sufficient amount of raw material in the future too so that manufacturing difficulties for a normal production because of a lack of raw materials are hardly to be expected. (Enclosure 18, page 49).

E.-2. Special Production Essen

	30 Sep 1938 RM	30 Sep 1939 RM	30 Sep 1940 RM
Stocks :.	66 737	121 508	352 804

The adaption of production to tips of larger dimensions from other alloys necessitated an increase in the stocks of interim products. Besides the stocks show an increased amount

(page 13 of original, cont'd)

for finished but not yet delivered tips; this is due to new inspection directives, w hich have meanwhile been changed in our favour.
(enclosure 19 page 50).

(page 14 of original)

E - 3. Special Production Bremen.

	30 Sep 1938 RM	30 Sep 1939 RM	30 Sep 1940 RM
Stocks :	533 796	1 209 570	711 108

At the beginning of the report year the Bremen turning shop had a large stocks of primary material part of which had to be used of an increase in the weight of production during the year on report. For this reason there is a reduction in stocks(enclosure 20,page 52).

E - 4. Special Production Wupp rtal.

	30 Sep 1938 RM	30 Sep 1939 RM	30 Sep 1940 RM
Stocks :	--	--	236 648

The primary material represents the main part of the stocks; its amount corresponds to current requirements.
(enclosure 21, page 52).

(page 14 of original, cont'd)

E - 5. Tool Shop

	30 Sep 1938 RM	30 Sep 1939 RM	30 Sep 1940 RM
Stocks :	70 097	66 159	99 812

The increase in stocks corresponds to an increase in production. (enclosure 22, page 53).

(page 15 of original)

F. New Installations. Progress.

F - 1a. Normal Hard Metal Production (Essen)

New installations granted:

1937/38 RM	1938/39 RM	1939/40 RM
--	1 814 050	--

The extension of the normal hard metal production came to a temporary standstill in the first few months of the year on report. From 1937 to 1940, the period of extension, the useful floor space of the productive departments increased by 26%; simultaneously the production increased by 40,7%, i.e. the space requirements decreased by 40,2% per kilogram of widia metal production. The quantity of mixture required for special production was also increased five times during the same period. This goes to show that the increased output of the hard metal installations is largely due to plant improvements and innovations. Larger furnaces, heavier pressing and grinding drums with an increased capacity were installed and large scale mechanisation and automaticity were put into practice.

(page 15 of original cont'd)

For instance, this gave us the advantage, during the year on report, that we could increase the production of widia metal by approx. 50% with only a 25% increase in the plant complement.

Mechanisation, particularly in the mixing shop, continued successfully. For the difficult mixture of Tungsten and carbon by machinery novel mixing machines were secured which have worked satisfactorily up to now so that an age-old problem seems to have found its solution.

(page 16 of original)

In the grinding room a further increase in the grinding output was accomplished: by the pendulum mills originally intended for mixing were used for the pulverisation of graphite so that some of the grinding drums of a 250 kilogram capacity could be used for the mixing of the primary mixture for special production.

Experiments to use large grinding drums also in normal production were successful.

Extensive experiments in the drying shop to replace the expensive and cumbersome dyhydration by the considerably cheaper vacuum distillation were successfully completed. In the course of the new year on report this working process will be generally introduced; with considerable savings in hydrogen and electric current.

(page 16 of original, cont'd)

The output of the carburisation shop was increased by the introduction of additional large carburisation furnaces. Mixing shop, grinding installation and carburisation are now in a position to produce approx 80 to 90 tons a month for special production. For the stamping shop a new 25 ton press working on the principle of top pressure was obtained It proved a great success. The automatic tip press installed in the previous year was improved so that a considerable improvement and advance in the former pressing process could be accomplished. When this press is used to capacity, its output is three times that of the former press. Obligatory German Industrial Standard forms for carbide metal tips will be introduced in the next few months which will necessitate the production of large series, for which the new press will prove very advantageous.

(page 17 of original)

In the shaping department the cutting method was further developed. This involved a fair amount of waste; since this waste can be used however, again, this disadvantage is offset by a great saving in wages and labor in the cutting process.

Work on the improvement, cheaper production, and on the evolution of new carbide metal brands was continued sucessfully. The possibility of replacing the expensive sugar coal (Zucker Kohle) by cheap soot in the production of carbide was investigated with the result that at the end of the year on report in the case of brand S3 both

(page 17 of original, cont'd)

the Tungsten carbide and the Titan carbide and in the case of brands S1 and S 2 the Tungsten carbide could be changed over to the use of soot.

As a further development of the brand F 1 containing 25% Titan carbide, which is intended for finish-machining, an alloy containing approx 60% Titan carbide, was produced; this resulted in an output three times that of F1 in precision drilling and also in the drilling of connection rods and airo engine cylinders.

The investigation of the effect of the sinter atmosphere on the properties of hard metals showed that the porosity of widia is much reduced when nitrogen is used in the furnace and the tips are embedded in aluminium oxide. We use this new method for tips which are to be highly polished as for instance in the case of delicate measuring instruments. Sintering in a vacuum is also advantageous for various applications.

The chemical and physical investigations resulted in further knowledge in regard to crystalline structure. For instance, with the same hardness and the same specific weight of the S1 alloy a great decrease in efficiency is possible if in the emulsification of

(page 18 of original)

Titan carbide into Tungsten carbide, Titan carbide mixed crystals are deficient. The latest testing of the quality not only applies to hardness and specific weight but also the structure of the metal.

The technical investigations of differential stresses were principally confined to the determination of the most favourable working conditions of the -

(page 18 of original, cont'd)

high precision machining brand F 2 and the definition of the most favourable ranges of cutting speeds for the titan carbide brands S1, S2 and S3.

F - 1b normal hard metal production (Wuppertal)

New installations granted:

1937/38 RM	1938/39 RM	1939/40 RM
---	---	2 230 000

As mentioned before, by order of the Army High Command the establishment of a normal hard metal plant as a reserve plant in one part of the Wuppertal turning shop was begun. The installation is to be completed in the new report year.

F - 2a Special production (gene. l)

Since the beginning of the special production at the end of 1935 until spring 1940 we have only made tips of one dimension. The experiences gained meanwhile with these tips and our own development work led to the manufacture of tips of 3 to 40 times the weight. Although our superiors did not make any suggestions or demands we have pushed ahead constantly with this development and have prepared and equipped ourselves for these new tasks at an early date. When, therefore,

(page 19 of original)

the Army High Command gave us orders for a short term delivery of the large tips we could effect the several adaptations to the different tips within

(page 19 of original, cont'd)

a very short time which was of great service to the armament program. If we had not had the foresight to do this developing work, the production of the small tips of which a sufficient number was available, would have had to be discontinued and the plants would have to be closed for some time at least, and the production of the larger tips would have been possible only months later. It is true that considerable technical, organisational, and personnel difficulties had to be overcome and a temporary drop in production was inevitable. The plant revenue was also materially affected by these change-over measures.

In detail these adaptations required a modification of alloys, also in part a reconstruction and an extensive new construction of machines. The larger tips required an alloy of greater toughness. In order to guarantee the reliability of the new production, for which no experiences were available and none could be collected in so short a time, a new testing method was evolved for the numerical determination of toughness.

Owing to the larger dimensions of the tips the sintering process had to be modified as well. Here a considerably better homogeneity of the working material was obtained, at the same time this process for the first time permits the repeated use of the graphite boxes.

As regards the machines, it was essential, generally speaking,

(page 19 of original, cont'd)

to cope constractionally with the higher mechanical and thermal stresses due to the larger dimension of the tips. For instance, formerly

(page 20 of original)

the drilling of the graphite blanks was done on light commercial turret lathes. The new production required the use of multi-spindle drilling machines of our own design, which together with other machinery were most difficult to procure under the prevailing conditions.

The attempts, initiated in the previous year on report, to fill the mixture into the press dies by machine were completed successfully, and for this purpose we designed a new filling and tamping machine. This machine has been largely introduced during the year on report.

We scored a special success in the utilisation of the large stocks obtained in short graphite blanks at the request of the Army High Command. The tips of larger dimensions require longer graphite blanks too, and to begin with it looked as if the large stocks could not be used which would have meant a loss of approx. RM 1 000,000.--. After intensive experiments, however, we succeeded in developing a method by which 2 short blanks could be joined into one long blank suitable for the production of the larger tips. This was not only advantageous financially but also facilitated the quick change-over.

F - 2. Special Production Assen

New installations granted :

(page 20 of original, cont'd)

1937/38 RM	1938/39 RM	1939/40 RM
--	4 065 000	--

The new buildings for the special production Essen, begun in 1938/39, was finished to about 60% of only the buildings by the end of the year on report. It will be summer before this installation can be ready for use.

(page 21 of original)

The present installations for the special production Essen have been used for development work on a large scale in the year onreport. The knowledge and experience gained here were utilised for our own production which reached a considerable extent, and also for the B and W turning shops, so that these installations could be employed on production exclusively.

F - 3. Spedial production Bremen.

New installations granted:

1937/38 RM	1938/39 RM	1939/40 RM
--	665 000	82 000

The enlargement of the Bremen turning shop was restricted to reconstructions occasioned by the change-over, the completions and extensions. In the basement a radial grinder was erected.

The amount of RM 82.000,-- granted in 1939/40 was used for the purchase of works premises which had previously been rented.

(page 21 of original, cont'd)

F - 4. Special Manufacture Wuppertal.

New installations authorized:

1937/38 RM	1938/39 RM	1939/40 RM
7 000	3 300 000	--

The first conveyor belt of the altogether 6 belts provided was ready for use in June and was immedia ly used for production. At the end of the year of report a to of 3 belts were in use; one more belt is about to be completed. The completion of the 2 other belts has for the time being been postponed, since the section in which the 3 belts are to be installed, is intended for the installation of a normal manufacture.

(page 22 of original)

To start operations with the 3 belts was possible only by the erection of a temporary transformer switch board, because the final installation was not completed in schedule time.

F - 5. Tool Shop.

New installations authorized:

1937/38 RM	1938/39 RM	1939/40 RM
9 000	1 139 800	--

During the year of report were invested:

By resolution No.	Late		Amount RM	Items	
818	30 June	1937	500 000	Machinery	total
899	20 Feb	1939	230 000	"	34 pieces

(page 22 of original, cont'd)

The removal of the tool shop into the new building was effected during the first months of the report year. The machinery equipment consisted at the end of the report year of 14 machine tools. There are still 34 machine tools missing, after the delivery of which the equipment of the tool shop as planned is completed for the time being.

During the report year the work of the tool shop was further increased by an enlarged production of tools, which require a special technique in grinding and polishing. The execution of this work was made much easier for is by the use of diamond studded hard metal grinding discs, manufactured in the Widia plant.

This development proved to be particularly benefical to the production of gauges for our special manufacture. The successes achieved herein have caused us to take up the production of gauges and messuring instruments at an increased rate.

(page 23 of original)

G. Manufacturing Costs.

G - 1. Normal Hard Metal Manufacture.

Costs per kg Widia metal	1937/38 RM	1938/39 RM	1939/40 RM
without raw materials:	37,66	30,68	28,84
raw material costs:	16,55	13,64	14,41
Total:	54,21	44,32	43,25

a) Manufacturing Costs without Raw Materials.

The costs have dropped further. From the average amount of RM 28,84 this does not fully transpire, because the share for auxiliary materials has risen from RM 1,78 to RM 3,44. This rise is not the result of an increased consumption of auxiliary materials but of a larger stock.

b) Raw materials.

The costs of raw materials have risen as a result of increased prices for raw materials, but they are still considerably below those in the year of report 1937/38 (Inclosure 23, page 54.)

(page 23 of original, cont'd)

G - 2. Special manufacture Essen.

Actual Costs per kg special product	1937/38 RM	1938/39 RM	1939/40 RM
without working material costs.	39,44	24,63	23,51
working material costs	14,52	9,14	9,80
Total:	53,96	33,77	33,31

A comparison between the actual costs in the year of report with those of the previous year is not possible because in the last months of the year of report, points of larger dimensions were produced.

(page 24 of original)

From the cost analysis of the first half year of the year of report we know that the costs of the small tips had dropped further. Concerning costs of tips of larger dimensions we shall have an indication only in the course of the new business year

G - 3. Special manufacture Bremen.

Actual costs per kg Special product	1937/38 RM	1938/39 RM	1939/40 RM
without working material costs	33,14	18,65	19,39
working material costs	15,27	8,86	9,46
Total:	48,41	27,51	28,85

What has been said for the special manufacture Essen applies equally to the special manufacture Bremen (Inclosure 25, page 56).

(page 24 of original, cont'd)

G - 4. Special Manufacture Wuppertal.

Actual costs per kg Special product	1937/38 RM	1938/39 RM	1939/40 RM
without working material costs	--	--	24,70
working material costs	--	--	11,51
Total:	--	--	36,21

The turning shop of Wuppertal was taken into use only in June 1940 so that no remarks can as yet be made as to costs.
(Inclosure 26, page 57.)

(page 25 of original)

G - 5. Tool Shop.

Costs per 100,--RM clearing value	1937/38 RM	1938/39 RM	1939/40 RM
without costs of working material	82,11	73,16	91,57
costs of working material	14,83	10,97	8,26
Total:	96,94	84,13	99,83

During the first months of the year of report the tool shop moved into a new building. Owering to the move the costs for repairs, replacements and depreciation have risen sharply. However for the greater part the rise in costs occurs only once. Furthermore the expenses for auxiliary materials show a considerable increase, which is to be put down to greater stocks (Inclosure 27, page 58).

H. Plant results.

H - 1. Normal Hard metal Manufacture.

	1937/38 RM	1938/39 RM	1939/40 RM
Revenue:	425 532	923 092	162 979

(page 25 of original, cont'd)

During the year of report the invoice prices were twice lowered in order to adapt them as much as possible to the actual costs. In spite of that and as a result of further progress in manufacture the plant results would have been considerably higher if no value adjustments of the raw materials had been made in the inventory.

(page 26 of original)

H - 2. Special Production Essen.

	1937/38 RM	1938/39 RM	1939/40 RM
Revenue	221 442	256 250	./.519 301

The plant terminates the business year only with an apparent loss. The proven loss consists i.a. of advance charges for grinding discs to the amount of RM 350 000, which are used in the new business year, and of reduction in value of the preliminary material of RM 170,000,--. This deduction in value was made purposely at the end of the year of report for a preliminary material the use of which at the time was not fully covered by orders. Meanwhile these orders have been given.

H - 3. Special Production Bremen.

	1937/38 RM	1938/39 RM	1939/40 RM
Revenue	635 686	3 287 391	./. 81 400

The loss shown is only an apparent one. In fact the plant has a considerable surplus. Around RM 300 999,-- for grinding discs which are needed only in the new business year, were debited in advance and around 300 000 RM for preliminary material deducted, details were given in the statement on the special production Essen.

H - 4. Special Production Wuppertal.

	1937/38 RM	1938/39 RM	1939/40 RM
Revenue	---	---	./.188199

The plant has started production only in June 1940. The actual plant results close with a small surplus. The loss has occured through the so-called starting costs, which were accounted for as working expenses.

(page 27 of original)

H-5. Tool shop.

	1937/38 RM	1938/39 RM	1939/40 RM
Revenue	49 430	157 910	162 269

(page 27 of original, cont'd)

The plant surplus contains about RM 148 000,-- which are shown by the tool shop as a result of a new clearing arrangement for hard metal between the Widia plant and the tool shop, which was made possible by the new Osko-contract in our favor. The actual surplus amounts to around 13 000,--. The drop in the actual operating surplus is the result of increased single expenditures, which were caused to the shop by removal to a new building.

(page 28 of original)

Appendix.

The branch works in England, Italy and France.

Coventry/England.

The deliveries of preliminary material were discontinued at the outbreak of war. As far as we know the works carried on with material from USA.

Castellamonte/ Italy.

By enlarging the finish-sintering plant the capacity was increased from 500 kg to 900 kg per month. The increased use of hydrogen is at present covered by the purchase of compressed hydrogen. A larger hydrogen generating installation has been ordered. The production of 2 694,05 kg during the business year 1937/38 and of 2 964,126 kg in the previous year rose during the year of report to 6 507,16 kg, that is an increase of 119,5%. The main share in the increase goes to the qualities S1, S2 and S 3 containing titanium carbide. The average for one tip rose from 23,98 to 26,1 g in the year of report. In the normal production in Essen during the same space of time the average weight of the tip was 17,4 g.

The total production of 6 507,16 kg is equal to a total profit of 10 037 094,60 Lire. The supply of the installation with mixture ready for pressing by us has been secured through the Adamas by the supply of Tungsten ore.

The works complement have developed during the past three years of report as follows:

	workers	employees
30 Sep 1938	14	4
30 Sep 1939	18	5
30 Sep 1940	48	5

(page 29 of original)

Dreux/France.

The completion of the installation had been made impossible shortly before the outbreak of war by the timely recalling of our specialists. Nevertheless the installation has, with American material, at times produced hard metal, even though of bad quality. In November 1940 the installation was made ready for production by us so that the production of satisfactory hard-metal without our assistance could be taken up.

CERTIFICATE OF TRANSLATION

13 February 1948

I, George Goodman, No. 34 789, hereby certify that I am thoroughly conversant with the English and German languages and that the above is a true and correct translation of document No. NIK - 13 122.

George Goodman,
No. 34,789.

"END"