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Office Memorandum • UNITED STATES GOVERNMENT

CONFIDENTIAL

TO : ORE, Scientific Branch DATE: 12 June 1947

FROM : Lester C. Houck

TI-6-71

SUBJECT: Transmission of Report on Engineering Bureau No. 2.

33667

SC

1. There is transmitted herewith for your information and retention a report [redacted] on the Engineering Bureau No. 2, Berlin-Niederschönhausen. Particular reference is made to the Bureau's activities in the development of turbines and wind tunnels.

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CENTRAL INTELLIGENCE GROUP
2430 E STREET, N.W.
Washington, D.C.

33667

10 June 1947 TI-6377

Country: Germany (Russian Zone)

Subject: Engineering Bureau No. 2, Berlin-Niederschönhausen: Development of Turbines and Wind Tunnels.

Information date: March, April, May 1947

Evaluation: B-2

1. Engineering Bureau No. 2 at Seckendorfstrasse (Podbielskistrasse) 21, Berlin-Niederschönhausen, is directly responsible to the Ministry for Heavy Machine Construction in Moscow. Completed projects are taken to Moscow by ranking Soviet engineers and technical queries are relayed to the bureau directly from the Soviet capital. Engineering Bureau No. 2 is concerned with the testing of turbine installations while Engineering Bureau No. 1, at the same address, deals with the construction of boilers for steam turbine installations. Although both bureaus are controlled by a central office in Pankow, their respective work is not related.

2. Engineering Bureau No. 2's research deals with gas turbines, with one or more combustion chambers using liquid, solid or gas, designed for power plants, ships and motor vehicles. The new aspect of this work is the intended use of natural or generated gas, coal dust, or Masut (the waste material produced by fractional distillation of petroleum).

3. The following projects have been completed or are still being worked on at the present time (early April 1947):

a) 12,000 KW power plant installations using Masut fuel.

b) 25,000 KW power plant installations using natural or generated gas.

c) 35,000 PS (HP.-hr.) ship engines using either fuel or heavy Diesel oil.

4. In order to provide the project division with exact information on production techniques and construction, the research division is considering the following problems:

a) The size, form and properties of combustion chambers.

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Combustion chambers using Masut fuel are first driven with Diesel oil as Masut requires a preliminary treatment. In place of natural or generated gas, city gas is now being used, since there are not sufficient amounts of the former gases in Berlin. The use of coal dust is only planned; this project will be activated within the next few months. The combustion chambers are being tested in the thermodynamics laboratory on a test stand which is constantly being enlarged.

b) Materials for turbo blades: loading temperature, 640° to 700°C.

The type of metal to be used is being considered by the metal research laboratory. Permanent testing devices, built especially for this purpose, have been provided. They permit a loading of the materials in the trajectory at temperatures of 640° to 700°C.

c) The form of turbo blades and condensors.

The most suitable forms of turbo and condensor blades and the pressure drop of individual parts, such as diffusors, are determined in the electro-technical laboratory, which has two wind tunnels.

Field Comment: Paragraph 4-c, dated April 1947, refers to two wind tunnels. The information following, submitted under a 20 March dateline, describes only one of these and no further information has yet been received indicating whether or not the second tunnel has been built on the same premises.

5. Simplified construction was sought in building the wind tunnel in the long hall of the former Old People's Home in Building 10, Seckendorfstrasse 21. Eiffel construction was adopted, since it was thought inexpedient because of space limitations and its special purpose to utilize wind tunnels of the type used by German industry or aviation.

6. The wind tunnel will be used chiefly to obtain current-technical (strömungs-technische) data for rotor and guide blades (Laufschaufel, Leitschaufel) in connection with axial turbines and blowers. Testing will seek to develop the most advantageous profile forms and appropriate grid emplacements (Gitteranordnungen). Multi-stage equipment also will be subjected to tests.

7. The wind tunnel, as planned, called for:

a) A transverse section to accommodate models of original turbine blades of a linear enlargement of 4:1 of a medium-sized turbine blade. This enlargement was chosen for technical measurement reasons.

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b) Injection velocity not to exceed fifty meters per second, especially with a normally operating jet unit, so that the manometer indicating the flow direction may be easily read.

c) Velocity profile of the measuring flow (Mess-strahl) to be as rectangular as possible; velocity range to show the lowest possible degree of turbulence.

d) Performance of the tunnel and its resistance to be calculated in such a way that, in addition to the requirements listed under a. and b. above regarding the jet cross section and injection velocity, there will be excess pressure of 150 mm of waterhead to overcome additional flow resistance.

e) The model should be easily accessible and it should be possible to determine the aerodynamic forces which are at play.

8. The requirements stated above have been met, as follows:

The blower consists of dual wheels, one with seventeen and the other with thirty-five blades, rotating about an axle. Both wheels are wooden. The turbine has an overall dimension of 1100 mm and an internal dimension of 646 mm, corresponding to a blade height of 227 mm. Each individual blade has a 41° angle at the base and a 24° angle at the tip. Blades in the forward rotor of the turbine are not set at an angle. The blower rotates at 1960 revolutions per minute. It is driven by an 80 HP polyphase current motor located in the cellar, power being conveyed through a v-belt. This is a makeshift arrangement, since it was not possible to secure a Leonard set which would have increased the rate of revolution. It is planned to use the present motor later on in conjunction with a Leonard set as a power supply unit.

The connecting piece has a cylindrically-shaped exterior. Symmetrical to the long axle, there is a metal conus which can be opened or closed at an angle of 5° plus or 5° minus, thereby increasing or reducing the air stream.

The wind tunnel tube at the top (or blower end) is circular in shape. In the tank section, it assumes a hexagon shape, becoming rectangular at the funnelled test section.

The tube tank contains several guide vanes which direct the air flow longitudinally, thereby reducing the turbulence of the air bouncing off the sides of the tank. These vanes also lessen the rate of air speed.

The tunnel tank is 6.4 meters long, with an internal rectangular dimension of 2.82 x 1.98 m². It contains two air rectifiers, each fronted by a screening sieve.

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The tunnel jet is funnel-shaped and its large aperture has the same dimension as the tunnel tank. The opening at the small jet end measures 0.4 x 1.02 m^2. The jet end is 300 mm in length and is constructed longitudinally.

An air flow measuring meter (pivot tube) at the jet opening has been constructed to hold models. Attachment I shows the turbine blades in a setting which would approximate actual operating conditions in a turbine. The air flow is forced upon the turbine blades over two delicate metal guides which hold the measuring instruments.

9. The wind tunnel has been constructed so that the research staff can easily reach the holding device.

10. Attachment II shows the ratio of performance of the blower transmission and the injection velocity. Attachment III shows the ratio of excess pressure in the jet injection and the injection velocity (taking into consideration a jet dimension of F_e - $0.4m^2$.)

11. It was hoped to attain 97% efficiency in the power plant installations planned by the project section, but tests revealed only 90% efficiency. Due to inadequate measuring devices, this 90% is only an approximate figure. Informant believes that, since present combustion chambers have not been fully developed as yet, this efficiency rate will be increased.

12. To facilitate more exact determination of combustion chamber efficiency, measuring methods are being improved. This work should be completed in early June 1947, at which time enlargement of the testing stand also will be finished. This latter improvement will provide a measuring channel (Messstrecke) for city gas fuel next to the Masut installation.

13. Masut experiments were performed in the presence of previously heated air. In place of the heat changer, a combustion chamber operated with Diesel oil was set in front of the experimental combustion chamber. It was found that the one fed with Masut operated most efficiently in air pre-heated to approximately 400 to 450°C. The Masut, warmed to abo 150°C., behaved like Diesel oil, except for a slight corrosion which c not be judged because of the short combustion time.

14. Since combustion chambers can only be driven on the test stands at 1 ata., though the original plan called for 8 or 12 ata., it was considered that test stands might be obtained from or set up for t purpose at, the Leuna-Werke. Negotiations are now being conducted (3 May).

15. On 28 April, an inspection was made by Karlshorst officials the work was rated satisfactory. It was felt that development c combustion chambers was not sufficiently advanced and it is pl double the number of employees to speed up this work. As a re the production of 12,000 motor vehicle installations during th of 1946, a special cash payment was distributed by Moscow ord weeks ago.

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