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THE DIESEL ENGINE POSITION OF THE SOVIET BLOC

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I. Description of the Industry.

A. General.

In the Sino-Soviet Bloc, the diesel engine industry has been developed best in the USSR, East Germany and Czechoslovakia. Hungary has a small diesel engine industry which, however, is very significant to the production of transportation equipment for export. Rumania, Poland and China have developing industries which although not yet significant are intended eventually to satisfy domestic requirements for engines. Bulgaria may be dismissed as a non-industrialized country which makes a few small primitive engines for domestic agriculture.

The USSR has concentrated on the production of small and medium sized engines for industrial and marine use. Only a few small engines (up to 900 horsepower) are produced for generating electricity in isolated areas. The major uses of diesel engines are for motor vehicles, locomotives, tugs and river vessels, portable electric stations, agricultural tasks, construction machinery, oil field equipment, submarine and other small naval vessels. Diesels of over 2000 horsepower are not currently produced and heavy diesels over 2000 horsepower which would be suitable for stationary power plants and merchant shipping are not planned. Special emphasis is given to high speed light weight engines for automotive, tank, locomotive and submarine use.

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East Germany and Czechoslovakia have been producing a wide variety of engines for all purposes in sizes up to 2,400 horsepower. Current plans are for East Germany to add engine models to its production in sizes up to 8,000 horsepower in order to supply its own shipbuilding industry as well as create a capability for supplying other Bloc countries with suitable large marine engines. Czechoslovakia intends to concentrate on light weight engines of high performance in sizes under 2,000 horsepower, most of which will be available with superchargers. The Czechoslovak industry is oriented toward the export market.

Poland is developing a diesel engine industry to provide for the needs of its ship building and oil field equipment industries. Only small engines are currently made, but it is planned to make very large marine engines (up to 5000 horsepower) under Sulzer license.

The chief function of the diesel engine industry of Hungary is to supply engines for the trucks, buses and rail trains which are Hungary's most important export items.

In Rumania, the diesel engine industry is developing in response to the needs of agriculture and as a complementary adjunct to the important oil field equipment industry.

China needs great quantities of diesel engines to provide motive power for the development of industry, agriculture and communications in a vast area which is not well supplied with electric power. Current major uses of engines in China are in irrigation, construction and marine

applications. Heavy stress is being placed on increasing the output of diesels, but the industry is only in the initial stages of growth and produces only a few engines of which the largest currently in production is capable of 670 horsepower.

B. USSR

The diesel engine industry of the USSR produces diesel engines for all purposes in sizes up to 2000 horsepower. The engine models and their applications are presented in Table 1. These engines are used as sources of power for river and ocean shipping, power stations (both central and portable), locomotives, oil field drilling, pumping and compressing work, cotton gins, excavators and construction machinery, air compressors, irrigation and construction pumps, trucks, tractors, combines and tanks.

In the course of expanding the production and refining of petroleum, the USSR appears to be increasing greatly the portion of total crude oil which is allocated to making diesel fuel, portending large increases in the installation of diesel power. The dieselization of the railroads is receiving heavy emphasis in the Sixth Five Year Plan. New plants are being built to produce diesels for tractors and combines. The development of new models of motor vehicle diesel engines is progressing. Recently, the last two non-diesel models of Soviet tractors have been equipped with diesel engines.

The Soviet Union has no intention of producing heavy marine diesels larger than 2000 horsepower, because, as Malyshev stated when he visited a shipyard in Great Britain in July 1956, it is better and cheaper for the Soviet Union to buy

heavy diesels abroad. The Soviets have placed orders for very large engines with Burmeister and Wain of Denmark (6 engines of 7.5 to 8.0 thousand horsepower and 8 engines of 6.0 to 6.5 thousand horsepower)[2/], MAN of West Germany and Sulzer of Switzerland.

Also according to Malyshev, the USSR gives precedence to the production of diesels for naval ships because it does not have the capacity to produce engines for both naval and merchant ships. He further stated that submarine engines had been tried unsuccessfully in big ships. He could have been referring to the repowering of the General Asi Aslanov class of tankers with four of the D-50 diesel electric sets which are used in locomotives and, possibly, in submarines. Withthe exception of the low-speed, heavy 8IR 43/61 engine which is used in vessels of the merchant type only, until recently, all Soviet marine diesels of 1000 horsepower or over had been intended for submarines and subchasers. Lately there have been produced a number of whalers, tankers and refrigerator ships with diesel electric drive incorporating light weight diesels of 1000 and 1800 horsepower.

C. East Germany

The diesel engine production program in the GDR is a well organized and coordinated one. Production of diesels began in a haphazard way about 1948-49 under great difficulty. The subdivision of Germany into occupation zones severed from East Germany the plants which could supply injection equipment, good quality ferrous materials and steel forgings. The GDR has made good progress in overcoming these obstacles by the organization of the production of these items within its own geographical area. The production of some items, such as very large forged crankshafts, has still

not been provided for locally, and the supply of these remains a problem.

Starting out with a hodge-podge of designs inherited from the industrial past of all Germany, the East German Commission of Specialists on Diesel Engine Design of the Research and Development Bureau of the Main Administration for Energy and Power Machinery has supervised a standardization program in diesel engine production. Many old designs have already been supplanted in production by new standardized designs, and many new designs are being prepared for serial production. By 1960, the GDR will have a wider range of engines in production than the Soviet Union has currently.

In a controlled economy, such as that of the GDR, savings in research and development costs, in investment in production facilities and in stocks of repair parts are possible by the standardization of a single model of engine for each particular type of application. Competition between plants for the market which any particular application presents does not exist. Such competition in market oriented economies stimulates the development of superior designs. However, by borrowing the best designs from abroad (and obtaining licenses to build those which depend on foreign know-how) the countries with planned economies can be assured of modern designs. Thus, East Germany can without major disadvantages conserve economic resources through a national engine standardization program.

Of the 43 diesel engine designs in the production program for 1953, [3] 21 were not in the standardization program. In the 1955 production program, [4] the number of non-standardized engines had been reduced to 15. Table 2

gives the characteristics of diesel engines in production in 1955. By 1960, only standardized engine designs will probably be included in the production program. The development program, reviewed by the Commission of Specialists in April 1955 [5] was consonant with and an extension of the development program reviewed in February 1953 [6] and indicated considerable progress. According to the 1955 program, by 1960 development will be completed and series production started on nearly 100 new standardized designs which will meet the conditions for applications from 2 horsepower to 3200 horsepower sizes. The characteristics of these which match the criteria for GOCOM control are given in Table 3.

Some of the forces which molded the engine production program of earlier postwar years have declined in strength or entirely disappeared. One of the strongest of these forces was the Soviet Union's demand for reparations in the form of marine engines and diesel generator sets. Reparations were once the biggest single destination of GDR engine output. The output of some engines once produced mainly for reparations has declined (for example the DV22h marine engine built at Rostock and the diesel generator set produced at Schoenbeck). A dependence on the legacy of the past, in the form of supplies of parts for engines produced in greater Germany before WW II and in the limited know-how of East German engineers and mechanics, is being overcome by the current growth in scope of industrial production, and the engine development program. East Germany shares with

Czechoslovakia the distinction of being the most important producer of diesels among the Satellites and will eventually be second only to the USSR in the Soviet Bloc. Shortages of supplies of acceptable grade raw materials are still vexatious and supplies of large crankshaft forgings are still difficult to obtain, but production has been rising continuously and will continue to rise.

D. Czechoslovakia

The diesel engine industry of Czechoslovakia is an expanding and technologically progressive industry which is based on many years of experience in the production of diesel engines for shipping and industry. Czechoslovak diesel engine plants are well equipped for producing diesel engines in sizes from 5 to 2000 horsepower, and Czechoslovak engineers are skilled in the design and production of these engines. Currently engines larger than 2000 horsepower are not produced and there are no plans for their production.

Table 4 lists the diesel engines which have been identified in the production of recent years in Czechoslovakia together with their salient characteristics. Table 5 lists the diesel engine plants of Czechoslovakia together with the types of engines currently in production. It will be noted from Table 4 that Czechoslovak engines are available for most industrial and marine applications up to the 2000 horsepower size.

The development of new pr improved engines is conducted jointly by the producing plants and the Institute for Diesel Engine Development in Prague. In its organisation the Institute contains a Design Supervision

Group, the members of which are constantly present at the producing plants except for one day of each week when they report in person to the Institute in Prague. Once each month the chief engineer and the director of the institute visit the plants to confer with the technical management of the plant. Prototype models are all built in the prototype workshops of the plants which will subsequently produce the engines, and are tested under the supervision of the members of the Design Supervision Group of the Institute.

Eleven diesel engine plants are tentatively identified in Table 5. In addition to these plants there is the Motorpal Plant at Jihlava, which manufactures all the injection equipment for the whole industry and the First Brno Machinery Factory, ZKG, in Brno, which makes superchargers. None of the engine plants makes its own injectors or superchargers. The diesel engine industry contains all the facilities necessary to produce diesel engines. Only rolled metals and raw materials are purchased from concerns outside of this industry. There is no shortage of forging capacity or forging quality steel to restrict output as the East German diesel industry is restricted. The industry has available engineers and foremen with long years of experience in diesel engine construction.

Research and development is being carried on constantly to widen the application and increase the performance of Czechoslovak diesels. New air cooled industrial engines are being developed. Until about two and one half years ago, Czechoslovakia was in close touch with Brown-

Boveri of Switzerland and Henry Ricardo of England in connection with supercharger problems. Brown-Boveri superchargers were imported for use with Czechoslovak engines. The Czechoslovaks now have their own superchargers on test and plan to expand the capacity of their engines by wide use of supercharging, especially in railroad applications.

3. Hungary.

Hungary does not have specialized diesel engine producing firms. Instead, Rather diesels are produced as part of the product mix of three firms whose main production is devoted respectively to motor vehicles, steam turbines, and locomotives and heavy electrical equipment.

The Csepel Motor Vehicle Plant, which produces diesel powered trucks, manufactures diesel engines in excess of the requirements of its truck output and supplies these engines to other plants for installation in buses, air compressors, construction equipment, combines, tractors, and other industrial equipment. Two sizes of Csepel engines are produced: the 4 cylinder, 80 horsepower size, and the 6 cylinder, 120 horsepower size.

The Lang Engineering Works, which primarily produces steam turbine generating sets and other heavy power machinery, occasionally produces large stationary or marine diesels. Smaller Lang engines in sizes ranging from 63 to 210 horsepower have recently been advertised for export, but they are not an important product of the Lang plant.

The most important producer of diesel engines in Hungary is the Ganz Railroad Car and Machine Works which specializes in the manufacture of diesel engines for railcar traction but also produces diesels for

stationary, marine and industrial use in sizes from 26 to 2000 horsepower. Ganz diesel powered railcars and unit trains are well known and used in many countries.

A description of engines believed to be in current production in Hungary is given in Table 6.

F. Poland.

Poland's diesel engine industry is new and is still in the initial stages of development. The Mechanical Equipment Plant in Andrychow has been making a few hundred diesel engines each year since at least 1951. These are small industrial engines for operating belt driven equipment in construction work, agriculture, etc. The sizes range from 8 to 48 horsepower. A factory at Puck has been producing small marine diesel engines for fishing vessels since 1953. These engines are rated at 75, 90 and 100 horsepower. The "Novotki" Mechanical Works in Warsaw has recently (November 1955) started production of the Soviet highspeed, light weight diesel engine, model 2D6 which is rated at 150 horsepower at 1500 rpm. This engine can be used in excavators, switching locomotives, large trucks, mobile electric stations, and ships. Poland is emphasizing its use in oilfield equipment. From this discussion it is obvious that Poland's output of diesel engines is negligible and far below its needs. The latest development in the Polish diesel industry is the purchase of a license from the Swiss firm Sulzer for the production of marine diesels in large sizes up to 5000 horsepower. The need to import such large engines has been a bottleneck in Polish shipbuilding.

3. Rumania.

The two most important producers of diesel engines in Rumania are the Ernst Thalmann Tractor Plant and the "23rd August" Heavy Equipment Plant. The Ernst Thalmann plant produces diesel engines of 35 horsepower in excess of its needs for equipping the tractors which are its primary product. The "23rd August" plant is a complex machine building plant which produces a wide variety of heavy machinery including locomotives, oil field machinery, construction machinery and diesel engines. The diesels produced by this plant are primarily for oil field work and of two sizes, 220 horsepower and 450 horsepower. The latter is known to be a copy of the Hungarian engine, Ganz XII 170/240, a 12 cylinder V-type and the former a copy of the Ganz VI JST 170. The 450 horsepower engine is the largest diesel in current production in Rumania, although it maybe noted that this plant has produced at least one 1000 horsepower engine from Soviet plans for use in a diesel electric locomotive.

Diesel engines for agriculture and construction work are the principle products of the Matyas Rakosi plant in Bucharest. This plant specializes in the production of small engines in sizes of 6-8, 15, 25, 50 and 100 horsepower. Both diesel and semi-diesel types are made. The same type of 6-8 horsepower engine is produced by the Independenta plant in Sibiu, although the principal products of the plant are parts for the Ernst Thalmann Tractor Plant.

Finally, the Steagul Rosu plant in Orasul Stalin is engaged in pro-

ducing the first of a new line of 105 horsepower diesel engines for use in the trucks which are its main product.

There is some evidence that the Rumanians intend to initiate the production of diesel locomotives and may enlist the aid of the Swiss firms Sulzer, Brown-Bovari, and Swiss Locomotive in the conversion of steam locomotive producing facilities to the production of a Swiss type of diesel electric locomotive.

B. China.

There are a number of plants in Communist China which engage in the production of diesel engines. A number of models of engines can be listed but it is not possible to estimate output except to say that the indications are that in 1955 it was between 100,000 and 150,000 hp and in the case of some models only a token. Engine plants and their products believed to be in production currently are as follows:

Shanghai

Nein-chung Diesel Engine Plant (established in 1925)

20 hp gasoline engines

200 hp diesel engines for electric power plants

250 hp diesel engines for marine use (The first ever produced in China was turned out in March 1953)

670 hp diesel planned to be started in 1956

Shanghai Diesel Engine Plant

2½ hp diesel engine with 55 gpm gas pump, 2000 rpm

5½ hp, 1 cylinder, 4 stroke, 2100 rpm, stationary

20 hp, 2 cylinder, 4 stroke, 1200 rpm, diesel, stationary

40 hp, 4 cylinder, 4 stroke, 1200 rpm, diesel, stationary

60 hp, 6 cylinder, 4 stroke, 1200 rpm, diesel, stationary

(Based on Soviet experience, production of the 1200 rpm engines began in 1953)

Wei-sung Machine Building Plant

6 hp engine (diesel?) hundreds being built

Wei-fang

Wei-fang Diesel Engine Plant (Ta-hua Machine Factory?, Hua-fang Plant?)

60 hp diesel, 6 cylinder, 108 mm bore, 140 mm stroke, generator, tractor, air compressor, marine uses. New product in 1954

40 hp diesel (new in 1953), 4800 kg, 225 rpm, 254 mm bore, 482.6 mm stroke

Tientsin

Tientsin Diesel Engine Plant

80 hp diesel with 20 hp gasoline starting engine, drives air compressor of 9 cu. meter per minute, capacity at 7 atmospheres of pressure

Wu-hsi

Wu-hsi Diesel Engine Plant

25 hp, 1 cylinder, 4 stroke, 203 mm bore, 241 mm stroke, 700 rpm, diesel for pumping water and drilling wells

40 hp, 4 cylinder, 4 stroke, 1200 rpm for irrigation, drilling, electric plants, small vessels

Chung-chin

Chung-chin Diesel Engine Plant

30 hp diesel, 2 cylinder, 4 stroke, 650 rpm

Nan-chang

Nan-chang Diesel Engine Plant

12 hp and 16 hp diesel engines

34 hp diesel powered mobile compressor

Tsinan

Tsinan Diesel Engine Plant

12 and 60 hp diesel engines (Model 2102 (4) diesel engines)

Kiangsi

Kiangsi Machinery and Equipment Plant

12 and 15 hp diesel engines

Tsung Wan (British Crown Colony of Hong Kong, 15 km north of Kowloon)

South China Iron Works

30 hp, 2 cylinder diesel engines for fishing junks

165 hp, 4 cylinder diesel engines for fishing junks

IV. Trade.

A. General.

Neither the individual countries of the Soviet Bloc nor the Soviet Bloc as whole is self-sufficient in the production of diesel engines in the quantities and varieties to meet every domestic requirement. Major current import requirements are for marine engines of over 2000 horsepower for merchant vessels. These large engines are needed in the shipbuilding programs of East Germany, Poland and the USSR.

B. USSR.

More is known of Soviet imports of diesel engines than of exports, and it seems safe to assume, on the basis of this rather great disparity of information that the Soviet Union is a net importer of diesel engines. Chief among its current imports are marine diesels from Czechoslovakia, Denmark, East Germany and the UK, mobile diesel generator and compressor sets from East Germany and diesels from Czechoslovakia for oil well drilling. The USSR indicated in May 1956 that under proper trade conditions (sic) it could place orders in the UK for delivery in the period 1956-1960 of the following marine diesels: 50-75 engines of 6,500 to 9000horsepower and 75-100 engines of 2000 horsepower.[14] In July 1956, the Soviet Economic Delegation visiting a firm of shipbuilders in Great Britain indicated that they would like to place an order for approximately 30 diesels of 12,000 horsepower size for merchant ships.[15] Also in May 1956, the USSR signed a trade agreementwith Denmark under which within 2 years the Danes will supply 14 diesel engines of 6000 to 8000 horsepower for ships.[16] Currently, Soviet diesel engine plants are not equipped to produce engines of

a size larger than 2000 horsepower. Only the "Russki Dizel" plant in Leningrad is producing 2000 horsepower diesels for merchant shipping, and that this domestic output is inadequate is testified to by the orders for this engine (8DR 43/61) which have been given to the Skoda plant of Czechoslovakia, and by the suggestion that as many as one hundred of this size of engine might be ordered from the UK in the 1956-60 period. 17/

Imports from East Germany are predominantly portable diesel electric power stations in 20, 40 and 60 horsepower sizes and two types of marine diesels of 400 horsepower at 500 rpm and 100 horsepower at 750 rpm respectively. From Czechoslovakia, the Soviet Union has imported Skoda marine diesels of 520 horsepower at 500 rpm and Skoda-built marine engines of the Soviet 8DR 43/61 type (2000 horsepower at 240 rpm). Six of the latter are believed to have been delivered in 1956. Several hundred 500 horsepower Czechoslovak diesels have been imported for oil field work. From Hungary the Soviet Union has imported marine diesels of the Ganz-Jandrassic VIII JMR 216 type which develops 400 horsepower at 750 rpm. Great Britain also has exported many diesel-electric sets to the USSR (650 metric tons valued at $922,000 were reported shipped from the UK to the USSR in the first half of 1956). Sweden shipped to the USSR in 1955 diesel power generating machinery weighing 364 metric tons and valued at $407,000. The only Western country which reported receiving diesel equipment from the USSR in 1955 was Finland which received 18 tons of small engines valued at $31,000.

C. East Germany

The GDR is a net exporter of diesel engines. Her imports of engines have been pretty well limited to special types such as the

V2-300 imported from the USSR as part of Soviet-built oil well drilling equipment. On the other hand, in the past seven years, the GDR has exported hundreds of thousands of horsepower of engines to the Soviet Union and the other Satellite countries. Although the USSR has been the recipient of the bulk of East German exports (mostly generator sets, and marine engines from Schoenbeck, Karl Liebknecht and Rostock), China, Bulgaria and Poland have been very good customers. Bulgaria has taken, mostly, stationary engines for electric stations, and Poland and China have shown a preference for marine engines. Absolute figures on this trade are not available.

B. Czechoslovakia

In addition to meeting domestic requirements, Czechoslovakia produces many diesel engines for export. Among the countries of the Soviet Bloc, it predominates in exports of diesel engines to the free world. In 1955, Czechoslovakia exported diesel engines valued at $1,787,000 to the free world and imported therefrom diesel engines valued at only $4,000, according to the information reported by Western countries. In the first half of 1956, according to the presently incomplete reports from the recipient countries, Czechoslovakia exported to the free world diesel engines valued at $736,000 and diesel generating sets valued at $150,000. The following tabulation indicates the distribution of these exports.

Recipient Country	Unit	1955 Quantity	1955 Value	1956 (first half) Quantity	1956 (first half) Value
Belgium-Lux	MT	79	$138,000	[illegible]	[illegible]
Brazil	Each	1286	880,000	633*	$396,000
Egypt	MT	17	16,000		
Finland	MT	7	11,000		
Indonesia	Each	479	317,000	460	289,000
Netherlands	Each	10	21,000	13	28,000
Switzerland	MT	35	23,000		
Turkey	MT	159	277,000		
Union of So.Africa	Each	45	11,000		
Yugoslavia	Each	85	93,000	261	23,000
Total			$1,787,000		

* Brazil also purchased 8 diesel generator sets valued at $150,000.

Czechoslovakia exports many diesel engines to the other Bloc countries. The USSR and China import marine diesels of the Skoda type in sizes up to 400 horsepower for the most part. Another very important item of export to the USSR is a 500 horsepower diesel for oil field work. Less important quantitatively but interesting as an example of Soviet needs is a 2000 horsepower marine diesel which is manufactured to Soviet specifications by the Skoda-Smichov plant for export to the USSR. Skoda has produced about 10 of these so far. Bulgaria has imported a number of Czechoslovak diesel generator sets of 1500 and 2000 horsepower sizes. Poland also is a good customer for Czechoslovak engines.

Almost all of the Czechoslovak exports to the West are small engines of the Slavia and Skoda type. Of the $1,787,000 worth of engines exported to the Free World in 1955, Brazil bought 1,286 engines for $880,000, that is, the engines had the low average price of $680. Indonesia bought 479 engines at an average price of $670. In 1956 Brazil paid an average price of $625 for each of 633 engines, and Indonesia paid an average price of $630 for each of 460 engines.

On the other hand most of the output of the larger engines is exported to other Soviet Bloc countries. The "Wilhelm Pieck" plant in Smichov (formerly called Skoda-Smichov) is the major diesel engine plant in Czechoslovakia and produces the largest engines. Of the current output of this plant (January 1957) 80 percent is planned for export to the USSR.

B. Hungary

Hungary does not produce enough diesels in all types and sizes to supply its needs, and it imports diesels from Czechoslovakia. Hungary is an industrialized country but does not produce domestically all the raw materials and semifinished goods necessary to its products. To help obtain essential imports, although not able to satisfy the domestic demand for diesel engines, Hungary exports a large proportion of its output of diesel engines.

Brazil purchased 167 Hungarian engines in 1955 for a total price of $89,000 which indicates that the engines were probably the very smallest (about 26 horsepower). In the first half of 1956, Brazil purchased 265 of these engines at a total price of $107,000. Indonesia bought 66 small

Hungarian diesels in 1955, and 45 of them in the first half of 1956.

The Soviet Union has been the recipient of the bulk of Hungary's exports of diesels in the post war period. China and Poland are also purchasers of Hungarian engines. It is not possible to estimate the current size of this trade.

Indicative of engine shortages in Hungary are invitations to bid for the supply of 300 diesels of 400 horsepower with reduction gearing for marine use. These invitations were sent to US and British engine manufacturers in 1954.

E. Poland

Poland has to depend on imports for diesels, and particularly for large marine diesels. Denmark, France, Italy, Switzerland, East Germany and Czechoslovakia have exported engines to Poland. Difficulties in obtaining diesel engines have been among the most difficult problems of Poland's shipbuilding industry.

F. Rumania

Although Rumania has exhibited diesel engines at trade fairs, there is no evidence that they have exported engines to the Free World. On the contrary, Rumania bought $180,000 worth of engines in 1955 and $154,000 worth of engines in the first half of 1956 from Switzerland. No information is available on Rumania's trade in diesel engines with the other countries of the Bloc.

G. China

China has a serious deficit of engines and has been importing them from East Germany, Czechoslovakia, Poland and Hungary. They are required for river vessels, fishing vessels, tugs, construction, irrigation, electricity

generation and many other economic activities associated with China's industrialization program.

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South China Iron Works - continued

Over 1500 engines installed in junks during two year period up to October 1954.

II. Quality of Soviet Bloc Engines.

A. General.

With a few exceptions, the quality of the diesel engines produced in the Sino-Soviet Bloc is inferior to the quality of the engines produced in Western Europe and the United States. Quality in a diesel engine is determined by its length of life, the required frequency of preventive maintenance, the frequency of failure in service and its suitability for the particular application for which it is intended.

Bloc made engines have a propensity for frequent failure, excessive weight, excessive maintenance and short life. Some engines give long trouble free service but are excessively heavy for the application (e.g., the East German DV 136 which is used in vessels on the inland waterways of the USSR). Others are light weight, well designed high performance engines but wear out too soon in service (e.g., the Skoda 6S275L which is also used in vessels on the inland waterways of the USSR).

The low quality of Soviet Bloc engines is due primarily to shortages of the preferred materials. Workmanship is also a factor in those countries which have recently initiated production. However, for the important producers (USSR, East Germany, Czechoslovakia and Hungary), defects arise for the most part from the use of substitute materials.

The designs which are employed are well tested, time proven designs which in many cases have been borrowed from diesel industries of western nations. However, examples can be cited to show that the Bloc industry has

not kept pace with the West in the introduction of improvements in design. Some of the better designs were originally developed in the Bloc countries before Communist control was effected as in the case of the Skoda engines of Czechoslovakia and the Jandrassic engines of Hungary. However good the designs, the determining factor of quality is the quality of materials available and it is in this respect that most Bloc produced engines are deficient.

B. USSR.

The designs of diesel engines which are built in the USSR are rather good, as would be expected, because they are the result of years of development by the diesel industries of other countries, notably, Germany, Switzerland and the UK. For example, the locomotive diesels of the Soviets are facsimiles of the US models, ALCO and Fairbanks-Morse. The YaAZ truck engines are copies of the Series 71 engines of the GMC Detroit Diesel Division. The Soviet submarine engines are copied from M.A.N. of Germany. The largest engine for merchant ships, the 2000 horsepower SDR 43/61 is from a design by Sulzer of Switzerland. In 1952, the Caterpiller Tractor Company determined, from an examination of a Soviet S-80 tractor which had been captured in Korea, that the S-80 diesel engine was as well made in most respects as the Caterpiller engine from which it had been copied, and the injectors on the Soviet model were more precisely made than the Caterpiller injectors.

When they do not copy complete engines, the Soviet engineers unhesitatingly employ foreign designs for parts of engines. A recent new Soviet truck diesel

embodies a built up crankshaft with roller bearings housed in a tunnel type crankcase - a Czechoslovak innovation. It also uses unit injectors of the General Motors type.

Although Soviet designs are taken from the developments of other countries, the Russians have had less than complete success in duplicating the quality of the copied engines. The 2000 horsepower SRE 43/61 (Sulzer type) engine of the Russki Dizel Plant gives considerable trouble in operation. In 14 months of operation in 12 ships of the Black Sea Steamship Company, 24 of these engines suffered total failures in operation of 6 cylinder blocks, 159 cylinder sleeves, 177 heads, 60 pistons, 23 piston heads, 1,924 injector nozzle sorings, etc. During this same period, 31 complete engine overhauls were conducted. Because of these expensive defects, some Soviet engineers have recommended that the production of this engine be discontinued. S/

Many defects are reported in Soviet motor vehicle and tractor engines. The tractor engines are said to be too heavy with respect to their power. The truck diesel YaA7-204 suffers from many defects of design and construction and gives a short life in service. Because of the excessive weight of the tractor diesels and the short life of the truck diesels neither is considered well adapted to construction equipment although both are used in this service.

The standardization program for diesel engine production in the USSR has permitted high volume production of a relatively ~~few~~ SOME number of models of engines, and has brought with it the economies associated with mass production. Another result of this standardization, however, has been the application of

engines to uses for which they were not suited. This has been particularly true for engines in the sizes used in inland waterway shipping. Since the end of World War II, work on standardizing engines for the Ministry of the River Fleet has been in progress and the results of that work will soon be manifested in the production of several new families of engines. However, during this interim period (since World War II) the river fleet has received quantities of engines which were originally intended for other applications. These are high speed short life engines, originally developed for tank and automotive use.

C. East Germany.

The quality of East German engines is influenced by three factors--technical knowledge, production facilities and the quality of raw materials. Only the last two factors present problems today, and only the last factor, raw materials, presents a serious problem. When viewed as a fragment of greater Germany's prewar economy, a fragment which was plundered of its production facilities by the Soviet Union and shut off from its metallurgical base in Western Germany by the imposition of zonal boundaries, it is not difficult to visualize the position in which the GDR's diesel industry found itself in the late 1940's. Its recovery began with the orders taken by some of the SAG plants for diesels and diesel sets of prewar designs which were contracted for by the USSR mostly as reparations. With the re-equipping of East German industry, new diesel plants were built and equipped, new designs worked out within the standardized engine program, and the facilities for component production were organized. However, East Germany continues to have a deficit

of some materials, particularly good cast iron and forging quality steel. Also a shortage of forging facilities of large capacity is currently bottle-necking the output of crankshafts for two important engine production programs. One is the production of large diesels for merchant ships and the other is the production of high powered, high speed, heavily loaded engines for PT boats.

Too often, engines are rejected or fail in service because of poor materials. Cylinder heads crack, crankshafts break, other parts wear rapidly and the weaknesses are more probably in the basic material than in design or workmanship.

That East German designs are modern is obvious from a study of characteristics of the engines in the development program and the newly developed engines which have been placed in production. The KVD21 is a good example of a high speed, high output engine with versatile application. It has a cylinder bore of 18 cm (6.81 in.), a stroke of 21 cm (8.27 in.) and is available in V-form cylinder arrangements of 8, 12, and 16 cylinders per engine. At 1500 rpm these engines are rated for continuous operation in a range of from 430 hp* for the 8 cylinder model with lowest b.m.e.p.** to 1700 hp for the 16 cylinder model with highest b.m.e.p. (supercharged). Engines in all cylinder arrangements are available with supercharging. These engines are intended for mine sweepers, locomotives, marine

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* hp - horsepower

** brake mean effective pressure

auxilliary engines, generator drives and rail motor cars. Some are to be built with aluminum blocks, and it is presumed that this variety may be used in mine sweepers because of the reduction of magnetic material in the engine.

A significant failure in GDR diesel production (which may be overcome eventually) has been the inability so far of the Ludwigsfelde plant to produce a successful copy of the Daimler-Benz PT boat engine, model DB-511. This engine, which is one of the heaviest loaded engines ever designed, is a V- form, 20 cylinder engine which develops 2500 and even more horsepower at 1630 rpm. The East Germans have given it the standard model designation of KVD 25, and are trying desperately to surmount the problems of its construction. They have rebuilt several prewar Daimler-Benz engines and installed them in test boats, but failures in operation have been frequent. To date the greatest problem is to produce serviceable crankshafts. In 1955, 20 prewar produced crankshafts and two crankshaft hammer dies were received from Skoda. Successful shaft production is not yet available in East Germany. The Seepolizei are reported to need 120 engines for 60 ships and the Ludwigsfelde plant, which was rebuilt specially for this purpose (starting in 1951), is only keeping its facilities busy by making spare parts for Junkers engines, and turning out motor scooters and small industrial plant trucks.

Although they have encountered problems in obtaining adequate materials to build high speed or highly loaded engines, the East Germans have produced many engines of moderate rating which seem to be performing satisfactorily in many countries, and because they have the necessary technical knowledge they will eventually successfully produce engines of the high qualities that their development program provides for.

D. Czechoslovakia.

Czechoslovak diesel engines are well designed, well made, engines and for the most part are medium and high speed types. This means that they are better adapted to installations where weight saving is a factor than to installations where a premium is placed on long life and weight is unimportant. That is, they are better adapted to vehicles, ships and portable equipment than to stationary power stations. In this connection, it might be noted that the Soviet Ministry of the River Fleet has criticised the use of Skoda 6S275L engine (400 hp at 550 rpm) in tugs and cargo ships because of compressor shaft breakage, cylinder sleeve cracks, high crankshaft wear, and the need for frequent maintenance. In contrast to this, the same organization has praised the slow-speed, heavy East German Buckau-Wolf engine (400 hp at 300 rpm) because it is reliable, cheap to maintain and has long life. Further development may very well increase the life of Czechoslovak engines without sacrificing lightness.

E. Hungary.

Only the Csepel and Ganz diesel engines are worth mentioning, the Ganz engines being of an older type and produced in an inconsequential volume. The Ganz engines are all of the world famous Jandrassic design which is characterized by easy starting even at low temperatures. Little is known about post World War II quality of these engines, but it is safe to assume that complaints, if any, could be only against materials or workmanship and not against design.

F. Rumania.

Rumanian engines are copies of Soviet, Hungarian, Swedish and possibly Czech engines. That they have not been as good as the prototypes is testified to by several critical official reports. An official Communique on the Fulfillment of the State Plan of the Rumanian Peoples Republic for 1956 asserted that 450 horsepower engines (Hungarian types) of the "23 August" plant were of unsatisfactory quality. [9] The RM-31 engines of the Matyas Rakosi plant are said to be heavier than similar Czechoslovak engines by 12 kilograms per horsepower.

G. China.

Chinese diesel engines ~~The engine models~~ are made from foreign designs. From photographs of some which were observed at the recent Cairo Fair it appears that the workmanship is good. One of the observed engines was recognizable as a Czechoslovak design in every detail. Although the designs appear modern, the quality of the materials used will determine the durability and performance of the engines in service, and so far we have no information on this point.

III. Estimates of Production.

A. General.

The output by the Sino-Soviet Bloc in 1955 of diesel engines for all purposes is summarized in the following tabulation: (estimated)

Producing Country	Type of Engine	Thousands of Horsepower
USSR	All types (except tank)	12,120
	Tractor	6,515
	Truck	1,600
	Industrial, stationary, marine	4,005
East Germany	All types	1,900
	Tractor	330
	Truck	890
	Industrial, stationary, marine	780
Czechoslovakia	All types	1,293
	Tractor	347
	Truck and Bus	849
	Industrial, stationary, marine	797
Hungary	All types	1,345
	Truck and Bus	645
	Industrial, stationary, marine	700
Poland	All types	Insignificant
Rumania	All types	Not available
China	All types	135
Bulgaria	All types	Insignificant
Total for USSR, East Germany, Czechoslovakia and Hungary only	All types (except tank)	17,358

B. USSR.

It is estimated that at least thirty plants are engaged in diesel production in the USSR at the present time. In 1955 these plants produced 4,005,000 horsepower of industrial, stationary and marine diesels, about 1,600,000 horsepower of truck diesels, 6,515,000 horsepower of tractor diesels and a large number of diesel engines for tanks. Of the industrial, stationary and marine engines, 270,000 horsepower were installed in 134 diesel electric locomotives. [10]

C. East Germany.

The output of diesel engines in the GDR has been estimated in terms of total horsepower of engines produced in 1955. In the following tabulation this information is presented for each plant which produced diesel engines for marine, stationary and industrial use in 1955 together with the estimated national total.

Estimated Production of Diesel Engines by Plant in the GDR - 1955*

Plant	Output (in horsepower)
Karl Liebknecht	500,000
Rostock	160,000
Johannisthal	45,000
Cunewalde	20,000
Leipzig	15,000
Goerlitz	25,000
Halberstadt	15,000
	780,000

* Engines for trucks and tractors are not included.

The official production data given in the Statistical Yearbook of the German Democratic Republic states that in 1955 there were produced 430,205 horsepower of marine diesel and gas engines and 5,305 stationary diesel and gas engines. Although these figures are ambiguous, it appears that they could be reconciled with those obtained through intelligence analysis.

D. Czechoslovakia

It is planned that Czechoslovak diesel engine production capacity will reach 1,280,000 horsepower annually by 1960. This figure is reported to be 58 percent higher than output in 1955, which means that about 800,000 horsepower (actually 797,000 horsepower) were produced in 1955.

In terms of horsepower, the bulk of the engines produced are of the Skoda type. However, in terms of numbers of engines, there has been a large increase recently in the output of small engines of the Slavia type for which there is a large and growing foreign market. Thus it is possible

to explain how production in 1960 can be only 58 percent above 1955 (horsepower basis) when production in 1956 is 52 percent above 1955 (number of engines basis). The following tabulation indicates available figures on aggregate engine production for several years (not including motor vehicle and tractor engines).

Year	Engines	Total Horsepower
1948	na	110,000
1953	na	462,000
1954	9,406	705,000
1955	10,474	797,000
1956	15,894	na
1960 plan	na	1,260,000

All of the tractors and buses and most of the trucks produced in Czechoslovakia are equipped with diesel engines. Most of the tractors (about 90 percent) have 26 horsepower engines and the rest have 42 horsepower engines. On this basis the output of diesel engines for tractors in 1955 and 1956 would be as follows:

Year	Engines	Horsepower
1955	12,570	347,400
1956	18,004	495,500

Most of the buses (about 90 percent) are Skoda buses of 135 horsepower and the rest (about 10 percent) are Tatra buses of 125 horsepower. On this basis, the output of diesel engines for buses in 1955 would be 1,112 engines totalling 149,000 horsepower.

It is estimated that of the 10,541 trucks produced in Czechoslovakia in 1955, at least 4000 were Skoda trucks of 135 horsepower and 1000 were Tatra

trucks of 180 horsepower, totaling 5000 diesel trucks with a total of 720,000 horsepower. In addition, an indeterminant number of Praga trucks had diesel engines.

B. Hungary.

The information necessary to estimate Hungarian diesel engine output is not available. However, fragmentary information indicates that Ganz production probably does not exceed 200,000 horsepower per year and that Csepel engine output in excess of engines installed in Csepel trucks probably is in the order of 500,000 horsepower per year.

During the period of the Second Five Year Plan, great increases in the production of diesel engines are expected. By 1960, it is planned to increase production to four times the 1955 level. The recent severe civil disorder in Hungary will undoubtedly prevent the realization of this goal although the extent of underfulfillment cannot yet be predicted.

C. Rumania.

In 1952, only 28,000 horsepower of diesel engines were produced compared to 98,000 horsepower which were planned. Absolute figures have not been announced since 1952, but the percentage increase figures which were released for 1955 and 1956 indicate that the absolute level of output of diesel engines is still quite low.

D. China.

The estimate of 1955 engine production is possible from the announcement that 1952 production was 27,600 horsepower and that 1957 planned production was 260,000 horsepower.[12] Also it was officially announced that

the output for the five year period 1953-1957 inferred) was to be 720,000 horsepower. [13] Graphical analysis, assuming a smooth production curve, results in the following output figures for the intervening years:

1953	50,000	horsepower
1954	85,000	horsepower
1955	135,000	horsepower
1956	190,000	horsepower

Table 2

GDR DIESEL ENGINE PRODUCTION PROGRAM FOR 1955

Model Designation*	BHP	RPM	COCOM List No	No of Cylinders	Bore (mm)	Stroke (mm)	Strokes in Cycle	Plant assigned for production	Applications and Remarks
(V66A)	2400	275	III	8	470	660	4	Halberstadt	Intended for installation in 10,000-ton merchant ships launched at Wernow Werft. Bugs are holding up installation. This engine is supercharged.
(V66)	1540	275	III	8	470	660	4	Halberstadt	Marine engine, essentially same as V66A, but not supercharged.
(V55A)	1340	333		8	365	550	4	Goerlitz	Marine engine, supercharged.
6NVD43	1200	520	III	6	354	430	4	Rostock	Marine and stationary engine, supercharged. Exported to Bulgaria for electric power stations, has an exhaust turbocharger and is copy of M&M design (Motorenwerk-Mannheim)
8NVD48A(DV148)	1000	375		8	320	480	4	Karl Leibknecht	Supercharged. Installed in vessels built in GDR.
(V55)	920	333		8	365	550	4	Goerlitz	Same as V55A but not supercharged, marine engine.
12KVD21A	800	1400	III	12	180	210	4	Johannisthal	New V-form with supercharger, marine, intended for Seepolizei minesweepers, 2 to be built ain 1956.
8NVD48 (8DV148)	720	375		8	320	480	4	Karl Leibknecht	Same as 8NVD48A except it has no supercharger. Marine engine.
6NVD48 (6DV148)	540	375		6	320	480	4	Karl Leibknecht	Marine engine.
8KVD21A	533	1400	III	8	180	210	4	Johannisthal	Marine supercharged, first engine still on test in September 19; Series production to start 1 Jan 56.
8KVD21	430	1500	III	8	180	210	4	Johannisthal	Marine, not-supercharged, for tugs and trawlers. Series output to start 1 Jan 56.
8NVD36 (8DV136)	400	500		8	240	360	4	Karl Leibknecht	Marine and stationary but mostly marine.
4NVD48 (4DV148)	360	375		4	320	480	4	Karl Leibknecht	Marine engine.
6NVD36 (6DV136)	300	500		6	240	360	4	Karl Liebknecht	Marine and stationary.
6KVD18 (SM6)	225	1700		6	150	180	4	Johannisthal	Cranes shipped to China, auxilliary ships engines, generator sets.
4NVD36 (4DV136)	200	500		4	240	360	4	Karl Liebknecht	Marine and stationary.
(6DV224)	150	750		6	175	240	4	Karl Leibknecht	Marine.
4KVD18 (SM4)	150	1700		4	150	180	4	Johannisthal	Marine railcars. mobile power plants.

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(6DV224)	150	750	6	175	240	4	Karl Leibknecht	Marine.
4KVD18 ([illegible])	150	1700	4	150	180	4	Johannisthal	Marine, railcars, mobile power plants.
[illegible]4.5 ([illegible]-15)	[illegible]	[illegible]	6	115	[illegible]	[illegible]	[illegible]	[illegible] at Werdau. Industrial.
([illegible])	100	750	4	175	240	4	Karl Leibknecht	Marine, auxilliary, stationary, excavators (also [illegible] made at Rostock but discontinued).
4KVD14.5 ([illegible]-15)	92	2200	4	115	145	4	Horch	For Horch truck H3A. Has much lower rating for industrial use.
(3DV-224)	75	750	3	175	240	4	Karl Leibknecht	Ship auxilliary, excavator.
3NVD21	63	1000	3	150	210	4	Diemo Leipzig	Marine and stationary.
(4F175) *	60	1150	4	125	175	4	IFA Brandenburg	For tracklaying tractor KS07/62.
3NVD18	53	1250	3	125	180	4	Diemo Leipzig	Marine and Stationary.
4NVD12.5 (Type 18)	52	1600	4	90	125	4	Phaenomen (IFA)	For Phaenomen trucks and in lower ratings for indu
3KVD14.5 (EM3-15)	45	1500	3	115	145	4	(Horch?)	Stationary.
(4F145-De)	40	1250	4	105	145	4	IFA Nordhausen	For Pioneer tractors and RS01/40 tractors.
(3HK65)	36	1500	3	65	2x105	(2)?	Karl Marx-Stadt	Marine and stationary.
2NVD18	35	1250	2	125	180	4	Diemo-Leipzig	Stationary.
2KVD14.5 (EM2-15)	30	1500	2	115	145	4	IFA Nordhausen	Stationary.
(2HK65)	25	1500	2	65	2x105	(2)?	Karl Marx-Stadt	Stationary.
1NVD18	17.5	1250	1	125	180	4	Diemo Leipzig	Stationary industrial.
(1HK65)	12.5	1500	1	65	2x105	(2)?	Karl Marx-Stadt	Industrial
(LD130)	1[illegible]	1200	1	115	150	4	Cunewalde	Horizontal, industrial.
(LD120)	8	1500	1	110	125	4	Cunewalde	Horizontal, industrial.
(VA(H65))	6	1500	1	85	115	4	Cunewalde, Phaenomen	Horizontal, industrial.

* Designation in parenthesis is plant model number. The other is the formalized national standard designation.

ITEM	ENGINE	PLANT	BHP	RPM
1.	8 DR 43/61	Russkii Dizel'	2000	250
2.	8 ChN 43/47 (1D)	Kolomna Plant	2000	470
3.	10D 20.6/2 x 25.4 (D-100)	Kolomna & Kharkov & Penza	2000	810
4.	8 Ch 43/47 (6D)	Kolomna Plant	1600	470
5.	8 Ch 30/38 (8D)	Kolomna Plant	(approx)1000	na
6.	D-50	Kharkov Loco. Plant	1000	740
7.	M-50	~~Unknown~~ Leningrad Factory of Trans, Mach. Bldg.	1000	1700
7.a.	M-601	ditto.	700	1500
8.	8 DR 30/50	Russkii Dizel'	800	300
9.	6 DR 30/50	Russkii Dizel'	600	300
10.	6 D 30/50	Russkii Dizel'	600	300
11.	6 Ch 36/45	Dvigatel' Revolyutsii	600	375
12.	38 KF-8	Kolomna Plant	600	500
13.	V2-600	imeni Voroshilov	600	2000
14.	V2-500	Ural Turbine Plant	500	1800
15.	4 Ch 42.5/60	Dvigatel' Revolyutsii	500	250
16.	6 Ch 23/30	Russkii Dizel'	450	1000
17.	4 DR 30/50	Russkii Dizel'	400	300
18.	6 ChN 30/38 (18D)	Kolomna Plant	400	400
18.a.	V2-400A	Ural Turbomotor Plant in Sverdlovsk (~~Russia~~)	400	1600
18.b	V2-300A	Unknown	335	1500

Table I

DIESEL, OIL AND GAS ENGINES PRODUCED IN THE USSR IN THE POST WW-II PERIOD

BORE (CM)	STROKE	NUMBER OF CYLINDERS	STROKES IN CYCLE	WEIGHT (MT)	SPECIFIC WEIGHT (KG/HP)	TYPE OF ENGINE
43	61	3	2	65	32.5	diesel
43	47	8	4	27.4	13.7	diesel
20.6	2 x 25.4	10	2	14.9	7.45	diesel
43	47	8	4	27.4	17.1	diesel
30	38	8	4	na	12.5	diesel
31.75	33	6	4	16	16	diesel
~~18~~	~~20,21~~	~~12~~ ~~na~~	~~4~~ ~~na~~	~~1.7~~ ~~na~~	~~1.7~~ ~~na~~	diesel
18	20,21	12	4	2.24	3.2	diesel
30	50	8	2	25	31.3	diesel
30	50	6	2	20	33.5	diesel
30	50	6	2	20	33.5	diesel
36	45	6	4	18	30	diesel
30	38	8	4	11.1	18.5	diesel
15	18	12	4	.9	1.5	diesel
15	18	12	4	.9	1.8	diesel
42.5	60	4	4	34	68	diesel
23	30	6	4	4.75	10.6	diesel
30	50		2	na	na	diesel
30	38		4	na	na	diesel
15.0	18.0	12	4	.9	2.25	diesel
15.0	18.0	12	4	.9	2.69	diesel

REMARKS

1. Reversible. Intended for merchant marine.

2. Exhaust turbine blower. Copy of MAN submarine engine.

3. Being built for TE-3 locomotives, but also proposed for diesel-electric ships. Copy of Fairbanks-Morse.

4. Same as Item 2, but without blower. Also a submarine engine.

5. Copy of MAN engine for submarine.

6. Copy of Alco loco. diesel. Model 6-12½ x 13-T. Has exhaust turbine blower. Can be used in submarines.

7. Marine engine, Turbocharged. Larger version of V2 engine

8. Same as M-50 but with reduced output and longer life for oil field work

9. Marine engine, reversible.

10. Marine engine, reversible.

11. Stationary. Same as Item 7 but not reversible.

12. Stationary.

13. Produced as a stationary engine for the generation of electricity. Used in oil well drilling.

14. For heavy tanks. Also produced at Chelyabinsk Tractor Plant.

15. For medium tanks. Also produced at Kharkov Locomotive Plant.

16. For stationary use.

17. Stationary, and marine. Also produced by Dvigatel' Revolyutsii.

18. Marine, reversible.

19. Marine, reversible. Production ended in 1951.

18a. Souped-up version of V2-300. Used in oil well drilling.

18.b Souped-up version of V2-300. Used in oil well drilling.

ITEM	ENGINE	PLANT	BHP	RPM
55.	4 G Ch 42.5/60	Dvigatel' Revolyutsii	400	250
56.	6 GSCh 15/18 (D6-GD)	Barnaul Plant	150	1500
57.	6 GSCh 16.5/21	Dvigatel' Revolyutsii	135	1000
58.	4 GSCh 16.5/21	Dvigatel' Revolyutsii	90	1000
59.	4 G Ch 18/26	imeni 25th October	80	750
60.	2 G Ch 18/26	imeni 25th October	40	750

2

ROKE	NUMBER OF CYLINDERS	STROKES IN CYCLE	WEIGHT (MT)	SPECIFIC WEIGHT (KG/HP)	TYPE OF ENGINE
	4	4	34	85	gas engine
	6	4	.95	6.35	gas engine
	6	4	na	na	gas engine
	4	4	na	na	gas engine
	4	4	2.04	35.5	gas engine
	2	4	1.8	45	gas engine

REMARKS

55. For tionary use where diesel fuel is scarce or gaseous fuel is cheap.

56. For n engines of river boats where diesel fuel is scarce and wood fuel is plentiful. A g generator is also required.

57. For in engines of river boats where diesel fuel is scarce and wood fuel is plentiful. A g generator is also required.

58. For in engines of river boats where diesel fuel is scarce and wood fuel is plentiful. Gas nerator required.

59. Smal power sta ons in connection with gas generators or other gas source.

60. Smal power sta ons in connection with gas generators or other gas source.

ITEM	ENGINE	PLANT	BHP	RPM
19.	D6	Borets	300	750
20.	6 Ch 25/34	imeni 25 Oktyabrya (Pervomaysk)	300	500
21.	V2-300	Barnaul Plant	300	1500
22.	Ya AZ-206	Yaroslavl Truck Plant	165	2000
23.	D6	Barnaul Plant	150	1500
24.	6 KDM-50	Chelyabinsk Tractor Plant	140	1000
25.	4 Ch 16.5/21	Russkii Dizel'	130	1300
26.	Ya AZ-204	Yaroslavl Truck Plant	110	2000
27.	KDM-46	Chelyabinsk Tractor Plant	93	1000
28.	6 Ch 12/14 (K-153)	Unknown	80	1500
29.	T-113	"Strommashina" Plant	63	1500
30.	6 Ch 10.5/13	imeni Mikoyan	60	1500
31.	D-54	Stalingrad Tractor Plant	54	1300
32.	2 D 20/30	imeni Budenny	50	430
33.	1 D 26/30	Kazan Mechanical Plant	45	430
34.	T-112	"Strommashina" Plant	42	1500
35.	2 Ch 13/18	imeni Kirov, Bolshoi Tokmak	40	1500
36.	4 Ch 10.5/13	imeni Mikoyan	40	1500

[redacted]

KE	NUMBER OF CYLINDERS	STROKES IN CYCLE	WEIGHT (MT)	SPECIFIC WEIGHT (KG/HP)	TYPE OF ENGINE
	6	4	5*	about 20.0	diesel
	6	4	7.0	23.4	diesel
	12	4	.9	3	diesel
	6	2	(approx).9	(approx)5.45	diesel
	6	4	.95	6.35	diesel
	6	4	na	na	diesel
	4	4	na	na	diesel
	4	2	.75	6.8	diesel
	4	4	2.1	22.6	diesel
	6	4	na	na	diesel
	3	4	.85	13.5	diesel
	6	4	.72	12	diesel
	4	4	1.27	23.5	diesel
	2	2	2.47	49.5	diesel
	1	2	3.3	73.3	diesel
	2	4	.75	18.3	diesel
	2	4	.85	21.3	diesel
	4	4	.58	14.5	diesel

*g fly wheel (fly wheel probably not heavier than 1000 Kg).

REMARKS

19. Produced exclusively for oil well drilling.

20. Marine and stationary. Testing finished November 1956. Promyshlenno-Ekonomicheskaya Gazeta, 7 November 1956 (FDD Summary 1243, 28 February 1957, OFFICIAL USE ONLY).

21. V2 engine with reduced speed and increased longevity for industrial and marine use.

22. Copy of GMC 6-71. Installed in YaAZ-210 trucks.

23. Based on V2 engine. Industrial and marine applications.

24. Six cylinder version of Item 22. Installed in Ch TZ tractor.

25. Marine and Stationary.

26. Copy of GMC 4-71. Installed in MAZ-205 and YaAZ-200 trucks and in industrial equipment and in ZIS-154 bus.

27. Copy of Caterpiller D8800 engine. Installed in S-80 tractor and in industrial and marine installations.

28. Connected to DGS-92/4 generator with flexible coupling. Moveable generating set.

29. For construction and roadbuilding machinery.

30. Industrial and marine application.

31. Installed in DT-54 tractor and used as an industrial engine. Also made by Kharkov and Altai Tractor Plants.

32. For small electric stations and MTS machine shops.

33. For small electric stations, agriculture and MTS machine shops.

34. For construction and road building machinery.

35. Auxilliary power plants for river and fishing vessels. Recently taken out of production.

36. Auxilliary power plants for river and fishing vessels.

REMARKS

37. Small electric stations, agriculture, MTS machine shops, and construction work.

38. Main propulsion engine for small river boats and fishing boats. Same as Item 30 but with marine reverse reduction gear.

39. Installed in KD-35 and Belorus tractors and in construction machinery including E-252 excavators. Also made at Minsk T. P.

40. For small electric plants and threshing machines.

41. For construction and road building machinery.

42. For small electric stations and agriculture.

43. Auxilliary power stations for small vessels.

44. For construction and road building machinery.

45. Auxilliary power stations for small vessels.

46. Main propulsion for fishing boats.

ne 47. Fishing boats of the far eastern basin.

ne 48. Small electric stations.

ne 49. For fishing boats of the Caspian basin.

ne 50. For small electric stations, agriculture, MTS machine shops, and geological drilling. Also made at Gorlavski Plant.

ne 51. Small electric stations for agriculture.

ne 52. For small electric stations, agriculture, MTS machine shops, geological drilling. Also made at "Borets", Gorlavski Plant, imeni Kirov in Tiraspol, and "XX Letiya of TSSR" Mechanical Works.

ne 53. For dairy and meat concerns.

ne 54. For agriculture and geological drilling.

ENGINE	PLANT	BHP	RPM	BORE (CM)
2 D 16.5/20	"Kommunist"	40	750	16.5
2 DSP 16.5/20	"Kommunist"	40	750	16.5
KD-35	Lipetsk Tractor Plant	37	1400	10
25 horsepower	Bel'tsy Engine Works	25	na	na
T-111	"Strommashina" Plant	21	1500	12.5
ID 16.5/20	Engels Machinebuilding Plant	20	750	16.5
2 CH 10.5/13	imeni Mikoyan	20	1500	10.5
T-62 (Andizhanets-13)	"Strommashina" Plant	13	1200	12
1 Ch 10.5/13	imeni Mikoyan	10	1500	10.5
10 horsepower	Petrozavodsk Metal Plant	10	na	na
K-50 (Kamchadal)	imeni Molotov (Khabarovsk)	50	400	25
42 horsepower	Saratov Mechanical Plant	42	na	na
SD 28/35.6	"Rybsudomotor"	40	300	28
ND-40	"Borets"	40	500	20
30 horsepower	"30th Anniversary of Komsomol"	30	na	na
ND-22	imeni Dzerzhinski	22	500	20
ND-9	Riga Machine Construction Works	9	720	13.8
ND-6	Tambovski Mech. Plant	6	640	11.0

Table II GDR Diesel Engines Now Under Development Which will Probably be Produced by 1960 (Meeting COCOM List Requirements)

Model Designation	BHP	RPM	COCOM List	Number of Cylinders	Bore (mm)	Stroke (mm)	Strokes in Cycle	Plant Assigned Production	Applications and Remarks
KVD25 (MB511)(D-2500)	2500	1630	I	20	185	250	4	Ludwigsfelde	V-form, supercharged, for PT boats. Now in pilot production.
16KVD21 SVWA	1700	1500	I	16	180	210	4	Johannisthal	V-form, supercharged, marine, series production to start 1 Jan 60.
10KZ70/110 (MAN type licensed)	8700	225	III	10	700	1200	2	Rostock	Marine but suitable for stationary power generation.
10KZ57/80 (MAN type licensed)	6650	225	III	10	570	800	2	Rostock	Marine but suitable for stationary power generation.
10KZD72-SRW	3250	250	III	10	480	720	2	Rostock	" "
8KZD72-SRW	2600	250	III	8	480	720	2	Rostock	" "
6KZD72-SRW	1950	250	III	6	480	720	2	Rostock	" "
8KVD60-SRWA	1600	300	III	8	400	600	4	Karl Liebknecht	Marine but suitable for stationary, has supercharger, series production to begin mid 1958.
12KZD48-SVW	1750	375	III	12	320	480	2	Rostock	Marine but suitable for stationary, pilot production in 1959, series production after 1 Jan 60.
8KVD48-SRWA	1200	450	III	8	320	480	4	Karl Liebknecht	Marine, but suitable for stationary, supercharged, series production begins mid 1958.
6KVD48-SRWA	900	450	III	6	320	480	4	Karl Liebknecht	" "
8KVD48-SRW	860	450	III	8	320	480	4	Karl Liebknecht	" " mid 1957.
12KZD36-SVW	960	500	III	12	240	360	2	Rostock	Marine or stationary, series production to begin mid 1959.
8KVD30-SRWA	700	750	III	8	240	300	4	Karl Liebknecht	Marine, stationary, supercharged, series production to begin 1 Jan 60.
6KVD30-SRWA	525	750	III	6	240	300	4	Karl Liebknecht	" "
12KVD26-SVWA	520	750	III	12	150	260	4		

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6KVD30-SRWA	525	750	IIII	6	240	300	4	Karl Liebknecht	Marine, stationary, supercharged, series production to begin 1 Jan 60.
12KVD26-SVWA	520	750	III	12	180	260	4	Rostock	Marine, stationary, supercharged, series production to begin 1 Jan 60.
8KVD30-SVW	530	800	III	8	240	300	4	Karl Liebknecht	Marine, stationary, industrial, pilot production to start mid 1959.
8KVD30-SRW	500	750	III	8	240	300	4	Karl Liebknecht	Marine, stationary, industrial, series production to start mid 1959.
8KVD26-SVW	400	750	III	8	180	260	2	Rostock	Marine, stationary, industrial, series production to start mid 1958.
6KVD30-SRW	375	750	III	6	240	300	4	Karl Liebknecht	Marine, stationary, industrial, series production to start 1 Jan 59.
12KVD26-SVW	360	750	III	12	180	260	4	Rostock	" "
16KVD21-SVW	860	1500	III	16	180	210	4	Johannisthal	V-form, not supercharged, marine, stationary, industrial, series output to start 1 Jan 60.
8KVD21-SVWA	860	1500	III	8	180	210	4	Johannisthal	V-form, supercharged, marine (mep is twice 16KVD-21-SVW), series output to start 1 Jan 58.
12KVD21-SVW	640	1500	III	12	180	210	4	Johannisthal	V-form, not supercharged, marine, industrial, stationary, series output to start mid 1957.
8KVD21-HBW	430	1500	III	8	180	210	4	Johannisthal	Flat, opposed cylinder (boxer), not supercharged, marine, stationary, industrial, series output to start mid 1959.

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Table 4

Specifications and Applications of Czechoslovak Diesel Engines

Type	Model	BHP	RPM	List No.	No. of Cylinders	Bore mm	Stroke mm	Strokes in Cycle	Weight of Engine (MT)	Application and Remarks
(USSR)	8DR 430(8DR 43/61)	2000	240	III	8	430	610	2	62	Merchant marine - exported to USSR.
Skoda	8S525*	2000	250	III	8	525	720	4	82.5	For stationary power plants.
CKD	CKD K8L310R*	1650	720	I	8	310	360	4	17.9	Supercharged highspeed locomotive engine.
Skoda	6S525	1500	250	III	6	525	720	4	66	For stationary power plants.
Skoda	Type 400	1250	400		5	400	480	2		
CKD	CKD 8S310R*	1000	750	III	8	310	360	4	17	Locomotive engine, unblown.
Skoda	8S350	900	375	-	8	350	500	4	31.2	Stationary or marine.
CKD	CKD 6S310R	750	750	III	6	310	360	4	10.5	Lightweight locomotive engine.
Skoda	Type 400	750	400		3	400	480	2		
Skoda	8S275P*	730	500		8	275	360	4	13.9	Stationary or marine.
Skoda	6S350	675	375		6	350	500	4	24.5	Stationary or marine.
CKD	CKD K 12V 170 DR*	650	1400	III	12	170	190	4	3	Locomotive highspeed engine.
Skoda	8S230 RP	625	750	III	8	230	280	4	5.63	Marine or stationary.
Skoda	6S275P*	550	500		6	275	360	4	11.5	Marine or stationary.
Skoda	6S230RP*	550	1000	III	6	230	280	4	4.6	Marine and portable applications.
Skoda	8S230R	534	1000	III	8	230	280	4	5.3	Used in Soviet oil fields.
Skoda	8S275	520	500		8	275	360	4	12.7	Stationary and marine.
CKD	CKD 12V 170 DR	450	1400	III	12	170	190	4	2.6	Lightweight locomotive diesel.
Skoda	4S350	450	375		4	350	500	4	18	Stationary or marine.
Skoda	6S230R	400	1000	III	6	230	280	4	4.3	Marine and portable applications.
Skoda	6S275	390	500		6	275	360	4	10.4	Marine.
CKD	CKD 8V 170 DR*	300	1400	III	8	170	190	4	2.04	Railcar engine.
Skoda	4S275	260	500		4	275	360	4	8	Marine or stationary.
CKD	CKD 12V 145 ATR*	260	1300		12	145	180	4	2	Portable applications, air cooled.
Skoda	6S160P*	250	1000		6	160	225	4	3.08	Marine and portable applications.
Skoda	6S220	240	600		6	220	300	4	6.5	Stationary or marine.
Skoda	8S160	240	1000		8	160	225	4	3.3	Marine or portable applications.
Skoda	8S140R	228	1500		8	140	200	4	2.66	Mostly used in mobile generator sets.
Skoda	6S160	180	1000		6	160	225	4	2.9	Marine or portable applications.
Tatra	T111	180	1800		12	110	130	4	1	Truck engine, air cooled.
CKD	CKD 8V 145 ATR*	172	1300		8	145	180	4	1.56	Portable applications, air cooled.
Skoda	6S140R	170	1500		6	140	200	4	2.26	Mobile equipment mostly.
Skoda	4S220	160	600		4	220	300	4	5.	Stationary or marine.
Tatra	T111	135	1450		12	110	130	4	1	Portable applications, air cooled.
Skoda	706	135	1750		6	125	160	4		Truck engine, water cooled.
CKD	CKD6V 145 ATR*	130	1300		6	145	180	4	1.3	Portable applications, air cooled.
Tatra	V-8	125	1900		8	110	130	4		Bus engine, air cooled.
Skoda	4S140R	114	1500		4	140	200	4	1.85	Mobile equipment mostly.

Skoda	6S275P*	550	500		6	275	360	4	11.5	Marine or stationary.
Skoda	6S230RP*	550	1000	III	6	230	280	4	4.6	Marine and portable applications.
Skoda	8S230R	534	1000	III	8	230	280	4	5.3	Used in Soviet oil fields.
Skoda	8S275	520	500		8	275	360	4	12.7	Stationary and marine.
CKD	CKD 12V 170 DR	450	1400	III	12	170	190	4	2.6	Lightweight locomotive diesel.
Skoda	4S350	450	375		4	350	500	4	18	Stationary or marine.
Skoda	6S230R	400	1000	III	6	230	280	4	4.3	Marine and portable applications.
Skoda	6S275	390	500		6	275	360	4	10.4	Marine.
CKD	CKD 8V 170 DR*	300	1400	III	8	170	190	4	2.04	Railcar engine.
Skoda	4S275	260	500		4	275	360	4	8	Marine or stationary.
CKD	CKD 12V 145 ATR*	260	1300		12	145	180	4	2	Portable applications, air cooled.
Skoda	6S160P*	250	1000		6	160	225	4	3.08	Marine and portable applications.
Skoda	6S220	240	600		6	220	300	4	6.5	Stationary or marine.
Skoda	8S160	240	1000		8	160	225	4	3.3	Marine or portable applications.
Skoda	8S140R	228	1500		8	140	200	4	2.66	Mostly used in mobile generator sets.
Skoda	6S160	180	1000		6	160	225	4	2.9	Marine or portable applications.
Tatra	T111	180	1800		12	110	130	4	1	Truck engine, air cooled.
CKD	CKD 8V 145 ATR*	172	1300		8	145	180	4	1.56	Portable applications, air cooled.
Skoda	6S140R	170	1500		6	140	200	4	2.26	Mobile equipment mostly.
Skoda	4S220	160	600		4	220	300	4	5.	Stationary or marine.
Tatra	T111	135	1450		12	110	130	4	1	Portable applications, air cooled.
Skoda	706	135	1750		6	125	160	4		Truck engine, water cooled.
CKD	CKD6V 145 ATR*	130	1300		6	145	180	4	1.3	Portable applications, air cooled.
Tatra	V-8	125	1900		8	110	130	4		Bus engine, air cooled.
Skoda	4S140R	114	1500		4	140	200	4	1.85	Mobile equipment mostly.
Skoda	4S160	120	1000		4	160	225	4	2.25	Marine or portable applications.
Tatra		100	2100		6	110	130	4		Truck engine, air cooled.
Skoda	3S160	99	1000		3	160	225	4	1.99	Marine or portable applications.
Skoda	6S110	90	1500		6	110	150	4	1.16	Marine or portable applications.
Skoda	4S110	60	1500		4	110	150	4	.89	Marine or portable applications.
Tatra	T912	60	1600		6	110	130	4	.6	Portable applications, air cooled.
Tatra	T114	47	1450		4	110	130	4	.51	Portable applications, air cooled.
Zetor	3S110	45	1500		3	110	130	4	.79	Marine or portable applications.
Zetor		42	1500		4	105	120	4		Tractor engine.
Skoda	2S110	30	1500		2	110	130	4	.6	Marine or portable applications.
Slavia	27D	27	1500		2	115	150	4	.53	Portable generators, welders, etc.
Zetor		26	1800		2	105	120	4		Tractor engine.
Skoda	1S110	15	1500		1	110	130	4	.4	Marine or portable applications.
Slavia	15D	15	650		1	155	180	4	.69	Agriculture.
Slavia	12D	12	700		1	145	170	4	.49	Agriculture.
Slavia	1S100A	9	1500		1	100	120	4	.27	Portable generators, welders, etc.
Slavia	8D	8	800		1	120	150	4	.35	Agriculture.
Tatra	1S100	7	1300		1	100	130	4	.26	Agriculture, construction.
Slavia	5D	5	900		1	100	125	4	.26	Agriculture.

* Still under development or in trial production in December 1956.