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PROVISIONAL INTELLIGENCE REPORT

PETROLEUM IN THE SOVIET BLOC.

PRODUCTION AND EXPLORATION OF PETROLEUM IN THE SOVIET ZONE OF AUSTRIA

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FOREWORD

This report is one of a series of provisional reports pertaining to petroleum in the Soviet Bloc. The entire series is intended to cover all phases of petroleum, natural gas, and synthetic liquid fuels in the Soviet Bloc. These reports are presented as an intermediate step in consolidating pertinent intelligence on the subject and not as a finished study. In the consolidation of the available information, various reports and documents representing research by other intelligence agencies were utilized along with the results of research and analysis by members of the staff of CIA.

It is intended that this series of reports will serve the following purposes:

- a. Represent a base for contributions and additions by CIA and other agencies actively interested in petroleum intelligence.
- b. Facilitate the selection of the specific and detailed gaps in intelligence warranting priority attention.
- c. Provide the basis for a broad study on petroleum in the Soviet Bloc and various studies directed toward specific critical problems.

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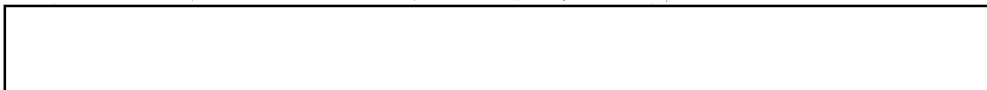
PRODUCTION AND EXPLORATION OF PETROLEUM IN THE SOVIET ZONE OF AUSTRIA

Summary and Conclusions

Within the European Satellites of the USSR the Soviet Zone of Austria is the second most important source of petroleum, Rumania being the most important oil producing Satellite. It is estimated that 2,400,000 metric tons of crude oil were produced in 1951. In 1952 the production from present facilities is expected to equal 1951 and rapid development of possible new discoveries could raise the 1952 production to 3,000,000 metric tons. (See II-A, AVAILABILITY OF CRUDE PETROLEUM IN THE EUROPEAN SATELLITES). However, a decline from present producing facilities is expected to a level of 2,300,000 metric tons in 1953.

All of Austria's oil fields are old and fully developed except the Matzen Field which was put on production in 1949, and which now accounts for more than half of Austria's crude oil production. Production is declining in all of the older Austrian oil fields. Available data indicate that current development of the Matzen Field 1/\* will probably compensate for the declining production of the older fields in 1952.

Any significant increase in crude oil production at this time will probably depend, in part, on the construction of storage facilities, as the present known storage 2/ and refining 3/ facilities are operating at maximum capacity. Additional storage, of the open type with a capacity of 100,000 tons 7/ is being considered by the Soviets.



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The proved oil reserves as of January 1952 in the Soviet Zone of Austria, are estimated at 11,966,000 metric tons, and are equivalent to 5 times the 1951 level of production.

The production of crude petroleum in the Soviet Zone of Austria is shown in Table 1. It is small when compared with that of the USSR. However, it is of considerable importance to the Soviet Bloc, for exports of crude oil and some refined products go to Czechoslovakia, East Germany, Poland and Hungary. Allocations of petroleum products to non-Soviet Austria have only recently equaled requirements for fuel oil and gasoline.

TABLE 1. ESTIMATED CRUDE PRODUCTION OF SOVIET ZONE OF AUSTRIA FROM PRESENT FACILITIES AND COMPARISON WITH USSR, 1950-1951

| <u>Year</u>      | <u>Soviet Zone Austria<br/>Crude Oil Production</u> | <u>USSR<br/>Oil Production a/</u> | <u>Percent of<br/>USSR Oil Production</u> |
|------------------|---|-----------------------------------|---|
| 1950             | 1,700.b/  | 37,500.                           | 4.5                                       |
| 1951             | 2,400.  | 41,000.                           | 5.8                                       |
| 1952             | 3,000.g/  | 44,000.                           | 6.8                                       |
| 1st Half<br>1953 | 1,770.d/  | 23,000.                           | 7.6                                       |

a/ USSR production from paper I-A, AVAILABILITY OF CRUDE PETROLEUM IN THE USSR.

b/ Total production for 1950 amounted to 1,299 thousand metric tons. 15/

g/ Present facilities are not capable of producing 3,000,000 metric tons in 1952; however rapid development of possible new discoveries in the Matzen Field may increase production to 3,000,000 metric tons in 1952.

d/ Present facilities will probably produce from 2,200 to 2,300. thousand metric tons in 1953; however new developments at Matzen in 1952 and additional discoveries in 1953 may increase production to the level indicated.

#### I. Crude Oil Production Estimates.

The crude oil production estimates for 1950 and 1951 shown in Tables 1 and 2

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are based on data compiled primarily from sources shown in Appendix A. The production forecasts for 1957 and 1958 were calculated from the line of best fit applied to the rate-cumulative production data for the period from June 1950 to September 1951, using the method of least squares and mathematical conversion to a rate-time basis. This method could not be used for the Van Sickle and R.A.C. fields because of inadequate data, where necessary the 1949-50 decline rate has been used for field estimates. This method of forecasting assumes that there will be no change in the rate or effect of development from year to year.

In Table 2 are listed the known producing fields of the Soviet Zone of Austria. All of the fields with the exception of Hitzel are old and some are producing considerable water. The Hitzel Field produces more than 50% of Austria's crude oil and can probably be further developed to raise the current level of production throughout 1952. Thereafter other sources of crude oil will be needed to maintain this production rate.

TABLE 2. ESTIMATED CRUDE PETROLEUM PRODUCTION BY EXISTING FIELDS, SOVIET ZONE AUSTRIA 1950-53  
(Thousand Metric Tons)

| Field                  | 1950  | 1951    | 1952       | 1st Half<br>1953 | 1952<br>Production Status |
|------------------------|-------|---------|------------|------------------|---------------------------|
| Hitzel                 | 257.4 | 1,440.9 | 2,109.0 g/ | b/               | Increasing                |
| (1) Aderklas           |       |         |            |                  | "                         |
| Mehlberg               | 430.0 | 438.9   | 425.0      | "                | Decreasing                |
| St. Ulrich-Hauskirchen |       |         |            |                  |                           |
| (1) Van Sickle Dam     | 179.2 | 129.0   | 136.0      | "                | "                         |
| (2) Flysch Ridge       | 104.0 | 94.3    | 85.0       | "                | "                         |

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TABLE 2. ESTIMATED CRUDE PETROLEUM PRODUCTION BY EXISTING FIELDS, SOVIET ZONE AUSTRIA, 1950-53 (Cont'd)  
(Thousand Metric Tons)

| Field            | 1950                   | 1951    | 1952    | 1st Half<br>1953 | 1952<br>Production Status |
|------------------|------------------------|---------|---------|------------------|---------------------------|
| Eistersdorf      |                        |         |         |                  |                           |
| (1) Goesting     | 87.6                   | 56.7    | 50.0    | b/               | Decreasing                |
| (2) R.A.G. Dome  | 200.0                  | 183.5   | 165.0   | "                | "                         |
| Itag             | 40.8                   | 36.7    | 30.0    | "                | "                         |
| Maustrenk        | n.a.                   | n.a.    | n.a.    | n.a.             | n.a.                      |
| Hohenrappersdorf | n.a.                   | n.a.    | n.a.    | n.a.             | n.a.                      |
|                  | 1,700.0 <sup>15/</sup> | 2,400.0 | 3,000.0 | 1,750.0          |                           |

a/ Data for Hitzon and Aderklaa were frequently combined and since production for each could not be determined both are here treated as a unit. Output from present facilities is estimated at 1304 thousand metric tons. The current development and exploration program is here credited to yield an additional 805 thousand metric tons making a total of 2,109.

b/ Data now available are not sufficiently complete to forecast the 1953 total output.

## 2. Petroleum Reserves and Future Prospects.

The proved crude oil reserves of the Soviet Zone of Austria are estimated at 11,966,000 metric tons. This is equivalent to about 4.9 times the 1951 annual production rate. Most important and difficult to evaluate are the reserves of the Hitzon area; there are very little engineering and geological data available for this field. The reserve estimates of the Hitzon and Goesting fields were

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determined by extrapolation of the curve of best fit to the rate-cumulative data available. The decline factors which were used came from the Van Sickle and Goesting oil fields as data from all of the other fields are inadequate at this time.

The estimates of proved reserves for the remaining fields were determined by multiplying their annual 1951 production rate by a factor of five. Such a relationship between current production and proved reserves is indicated from a study of the 1951 Matzen production rate and its relation to the estimated proved reserves determined for that field. The Goesting Field was not used to determine the above relationship as this field is much nearer the end of its productive life, and any relationship established in the Goesting Field would be less applicable to the other Austrian fields than from the Matzen Field. The proved reserves as of January 1952, for the Austrian oilfields are summarized in Table 3.

TABLE 3. PROVED CRUDE OIL RESERVES IN THE SOVIET ZONE OF AUSTRIA AS OF JANUARY 1952

| Field                  | Thousand Metric Tons |
|------------------------|----------------------|
| Matzen                 | 7,000.               |
| (1) Adorkina           |                      |
| Muhlberg               | 2,190.               |
| St. Ulrich-Hauskirchen | 1,258.               |
| (1) Van Sickle         |                      |
| (2) Flysch Ridge       |                      |
| Zistersdorf            | 350.                 |
| (1) Goesting           |                      |
| (2) R.A.G. Doms        | 917.                 |



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TABLE 3. PROVED CRUDE OIL RESERVES IN THE SOVIET ZONE OF AUSTRIA AS OF JANUARY 1952. (Cont'd)

| Field            | Thousand Metric Tons |
|------------------|----------------------|
| Itag             | 183.                 |
| Naustrenk        | 60. <u>g/</u>        |
| Hohenrappersdorf | <u>n.s.</u>          |
|                  | 11,966.              |

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3. Future Explorations.

Future explorations will be most likely to succeed in the broad arch trending northeastward through Matzen and Aderklaa. However, the location of structures favorable for the accumulation of oil and gas will require extensive exploratory work and deep drilling. Reported Soviet exploration activities are centered within this broad arch. Most reported Soviet activities have been directed toward the extension of various proven fields through lateral extension rather than deeper drilling. The most promising area is in the Matzen Field where 12 wells b/ were being drilled in September 1951. 1/ The Matzen Field is not considered completely defined although eleven abandoned wells, which were probably dry, are located in the northeast, east, south and southwest sections. There is still adequate space for the completion of many new wells in the current well-spacing pattern, and these minor extensions will probably be made. 1/

Since Soviet drilling activities seem to be concentrated within the Matzen Field, the productive area of the field will probably be defined before the end of 1952.

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Other drilling activities are being carried out in the Fischamend 6/ - Enzersdorf-Klein-Neusiedl area 7/ and at Hohenruppersdorf 2/, Aderklaa 8/, Floridsdorf and Kagran areas 9/. The Hohenruppersdorf Field was considered exhausted in 1949; however prospects may exist in deeper sand zones. Deeper drilling is being carried to these lower zones by the Soviets 3/. Thus far there have been no reports of production from the Hohenruppersdorf Field during 1950.

Exploration activities designed to locate new prospects are not reported and are probably not being undertaken at this time. This may reflect Soviet confidence in the productive capacity of the Matzen Field.

#### 4. Petroleum Geology.

Austria is mostly mountainous and hilly. However, four basins are developed within its boundaries. They are: (1) Inner Vienna Basin, (2) Outer Vienna Basin, (3) Bavarian Basin, (4) Hungarian Basin. It is within these basin areas that known oil fields and oil prospects are located.

The geologic age of the strata in the mountain ranges and basin areas of Austria range from Pre-Cambrian to Oligocene. The present mountains developed from Alpine orogenies extending from late Cretaceous to the Oligocene. There followed a period of erosion and normal faulting of considerable magnitude. The basins resulting from subsidence along the faults were inundated by the sea and great thicknesses of brackish-water and Marine deposits, of Miocene age were laid down. Conformable fresh water deposits of Eocene age followed.

##### a. Inner Vienna Basin.

The Inner Vienna Basin is about 200 km long and 60 km wide and extends

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across northeastern Austria and southern Czechoslovakia. Geologically it is a depression filled with Quaternary and Upper Tertiary formations overlying a basement consisting of shale, sandstone and limestone. The youngest basement rock is the Flysch which is Upper Cretaceous to Oligocene in age and consists of alternating thin bedded sandstone and shales with occasional calcareous sandstones and thin limestones.

This basin is separated from the Outer Vienna basin to the north and west by the Schrottenberg fault and a narrow alpine fold.

b. Outer Vienna Basin.

The Outer Vienna Basin is located west and north of the inner basin and has had comparatively little exploratory work done as it contains less organic marine sediments, which are important in the formation of oil, than the Inner Vienna Basin. All the Pliocene and Upper and Middle Miocene formations are absent.

c. Hungarian Basin.

The Hungarian Basin lies southeast of the Inner Vienna Basin from which it is separated by the little Carpathian Mountains. The small part of the basin which extends into Austria is considered to be unfavorable for oil accumulations because of the lack of adequate source rocks above the metamorphic or igneous rocks of the basin floor. The Miocene and Pliocene beds which are the sources of oil elsewhere in the Great Hungarian Basin appear to be missing in this area.

d. Bavarian Basin.

The Bavarian Basin extends westward from Vienna into Bavaria and offers considerable promise for the development of oil and gas production. A portion of

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this basin has been explored for oil and gas; several favorable areas for petroleum accumulation have been located, particularly at Grieskirchen and Laiskirchen.

### 5. Production History

Although oil production increased steadily following completion of the first commercial well in 1932, Austria's output was small until the country was annexed by Germany in 1938. After certain changes in Austrian laws, German firms commenced immediate development northeast of Vienna. The St. Ulrich-Hauskirchen and Gaisleberg fields were discovered and developed; other fields were soon located and Austrian production commenced to increase. Production increased steadily until 1944 when a peak of 1,213,036 metric tons were produced.

In April 1945, the USSR captured the Austrian oil fields practically undamaged. Production lagged under Soviet management, but by 1947 it had been increased to 927,430  $\frac{1}{2}$  metric tons. Thereafter production declined largely because of the over-production practices of the German and Russian managements. Development of the Inzen prospect, discovered by the Gecony-Vacuum and the Thell Group prior to World War II, increased production in 1949 and today provides more than half of Austria's oil. In Table 4 are summarized available annual production data.

TABLE 4. AUSTRIAN ANNUAL OIL PRODUCTION  $\frac{1}{2}$

| Year | Thousand Metric Tons | Year | Thousand Metric Tons |
|------|----------------------|------|----------------------|
|      | Crude Production     |      | Crude Production     |
| 1932 | 0.072                | 1947 | 621.90               |
| 1937 | 0.302                | 1948 | 367.05               |
| 1944 | 1,213                | 1949 | 1,103.20             |

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TABLE 4. AUSTRIAN ANNUAL OIL PRODUCTION 5/ (Cont'd)

| Thousand Metric Tons |                  | Thousand Metric Tons |                     |
|----------------------|------------------|----------------------|---------------------|
| Year                 | Crude Production | Year                 | Crude Production    |
| 1935                 | 6,657            | 1944                 | 1,213.00            |
| 1936                 | 7,418            | 1945                 | 0.53                |
| 1937                 | 32,846           | 1946                 | 191.00              |
| 1938                 | 56,656           | 1947                 | 913.10              |
| 1939                 | 144,924          | 1948                 | 907.80              |
| 1940                 | 412,452          | 1949                 | 1,159.00            |
| 1941                 | 623,900          | 1950                 | 1,700.00 <u>15/</u> |
| 1942                 | 867,849          | 1951                 | 2,400.00            |

6. Oil Fields:

The known oil fields of Austria are all located in the Zisterndorf area which extends from Adorfica, just westward of Vienna through Natten and Gansersdorf\*, Heinsiedl, Alt Lichtenworth and up to the Czechoslovakian border. Table 5 summarizes the Austrian fields in some of their more important characteristics.

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TABLE 5. AUSTRIAN OIL FIELDS

| Field                     | Discovery Date | Cumulative Production to Dec. 1951 (metric tons) | Proved Area Acres | Productive Formation             | Further Development        |
|---------------------------|----------------|--|-------------------|----------------------------------|----------------------------|
| a. Hitzan                 | 1929           | 1,833,510  | n.a.              | Miocene                          | Good                       |
| (1) Aderkian              | 1942           | 1,173  | n.a.              | "                                | Possible at greater depth. |
| b. Muehlberg              | 1942           | 2,050,000  | 3007              | U.Miocene<br>J.Middle<br>Miocene | Poor                       |
| c. St. Ulrich-Hauskirchen |                |  |                   |                                  |                            |
| (1) Van Sickle (Neusiedl) | }              | 4,260,000  | 2,200             | Miocene                          | Poor                       |
| (2) Flysch Ridge          |                |  |                   | Miocene                          | Possible                   |
| d. Zistersdorf            |                |  |                   |                                  |                            |
| (1) Geesting Dome         | 1932           | 2,356,000  | 325               | Miocene                          | Possible                   |
| (2) R.A.G. Dome           | 1937           |  |                   | 100                              | J.Miocene                  |
| e. Itag                   | n.a.           | n.a.   | n.a.              | n.a.                             | n.a.                       |
| f. Inustrenk(Krausfeld)   | 1941           | 149,500  | 100               | Miocene                          | Poor                       |
| g. Boheruppersdorf        | 1941           | 11,860   | 25                | U.Miocene                        | Possible at depth.         |

\* A new discovery at Zistersdorf, was reported in 1950. Nothing further is known.

#### a. Hitzan Field.

The Hitzan Field is located just south of the village of Hitzan, 30 km. northeast of Vienna and southwest of Boheruppersdorf. The Soviets developed this field from explorations carried out by the Geosyn-Voestag and Shell Oil Companies prior to World War II. There are very little engineering and geological data

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available for the field. Production has been reported from several zones of the Miocene and Schlier 10; the structure of the field is thought to be that of a large dome 10 and similar in this respect to the structures in other Austrian Fields.

The prolific production from the Matzen Field is attributed to several different pay zones and a high reservoir pressure. The large production of the field indicates permeable sand pay zones, probably tens of meters in thickness and a strong reservoir pressure. The latter is undoubtedly caused by a water drive in the oil bearing zones as the Matzen Field was reported to be producing 12% water in September 1951. The water content of the current production is not necessarily significant as most oilfields normally produce a certain percentage of water during their productive life; however an increase in water content would be significant as it would indicate a limited remaining oil reserve.

The future production from the Matzen Field cannot be accurately predicted from the data now available. However certain data, which are probably true, indicate a probable production decrease from present facilities in late 1952 and 1953. Current Matzen production is reported to come from a 1,700 meter depth 2 which is at or near the top of the saturated zone. The lowest pay zones are produced first and as they become flooded the wells are plugged back to the next higher pay zone. The lower zones of the Matzen Field have become flooded and future production must come from the upper zone or zones. There is not available sufficient data to indicate the potentialities of the present producing zone or zones. Production practices determine to a large extent the availability, and

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to some extent the ultimate recovery from any oil field. Soviet practices appear to be directed toward extracting all available oil as rapidly as possible 11/.

The spacing of the wells in the Matzen Field produces a high output while the field is still young, but ultimate recovery may be adversely affected.

**The Soviet well spacing program in the Matzen Field may accelerate the decline of production in late 1952 and 1953.** The increase in output for 1952 in the Matzen Field is expected to about equal the declining production from the older Austrian fields. The relationship of the location of the abandoned wells at Matzen with regard to producing wells is such that there is sufficient area to drill new wells, during 1952, which will probably be productive. Considering the producing area of the Matzen Field, at present and the wells now being drilled, together with the abandoned wells which are presumed to be dry, it seems probable that the productive area of the field will be fully defined in 1952 1/. In 1953 production from the Matzen Field will hardly compensate for the declining output of the older fields. A study of the production data at hand suggests a decline for Matzen in that year.

(1) Aderklaa Field.

The Aderklaa Field is located 10 km. northeast of Vienna on a broad flat dome. The following stratigraphy is typical of wells in this Field.

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1. Pliocene (Pannonian) Surface to 740 to 790 meters.
2. Upper Miocene (Sarmatian) marl with sand partings 570 meters.
3. Upper middle Miocene (Tortonian) shaly marl with sand partings - more sand in lower half with a basal conglomerate 200 meters thick.
4. Schlier 500 meters nonfossiliferous slaty marl and sand partings.
5. Flysch - identified from a few wells.

Production has consisted for the most part, of gas from several sands in the Schlier. Water usually appears shortly after production is started.

Considering the recent success of the Soviets in other fields future prospects from deeper drilling are not unlikely.

b. Muehlberg Field.

The Muehlberg Field is located slightly east of Muehlberg village, 17 km. from Zistersdorf and 60 km. northeast of Vienna.

The Field lies on the east side of the Steinberg fault; the producing area occupies the top of a small half dome, the western flank of which was cut off by the <sup>Steinberg</sup> fault, which dips to the southeast at 50°. The upper strata form a broad arch which narrows in width with stratigraphic depth. The oil bearing sands which are Upper Tertiary in age, are inclined slightly away from the south. Oil saturation is confined to a narrow area 1,300 to 1,400 meters long and 300 to 400 meters wide adjacent to the fault. The producing zones carry water down dip.

Stratigraphy of the Muehlberg Field.

- (1) Lower Pliocene (Pannonian) sand, shaly, marl and clay, 400-500 m. thick.

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- (2) Upper Miocene (Sarmatian) alternating sand and marl 450 to 750 meters thick.
- (3) Upper Middle Miocene (Tortonian) alternating sand and marl. 600-700 meters thick.

Past production has come from sands of the middle Miocene; eight sands with an aggregate thickness of 150 meters were being produced in 1977. Gas was being produced from four sands at the Lower Pliocene and Upper Miocene at depths of 475 to 1200 meters. In 1946 prospects for future production were considered good in the middle Miocene, however current prospects for new discoveries are considered poor at this time.

c. St. Ulrich Hauskirchen Field.

The St. Ulrich Hauskirchen Field is located 5 km. north of Zistersdorf. The field consists of two structures which are separated by the Steinberg fault. East of the fault production comes from a structure known as the Van Sickle Dome. The area west of the fault is called the Flysch Ridge.

Stratigraphy of the St. Ulrich Hauskirchen Field.

- (1) Lower Pliocene (Pannonian) sand, clay and marl 600 to 800 meters thick
- (2) Upper Miocene (Sarmatian) sand, clay and marl 700 meters thus far penetrated.
- (3) Upper Middle Miocene (Tortonian) sand, clay and marl 700 meters thus far penetrated.

(1) Van Sickle Dome.

The strata of the Van Sickle structure have been gently arched to form a

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semi-dome west of the Steinberg fault. The Upper Miocene and Upper Middle Miocene dip away from the fault at angles from 10° at the top of the Upper Miocene to 35° in the Upper Middle Miocene. Minor faults, parallel and transverse to the major fault are known. In the southern part of the Field, two transverse faults with a throw of 60 to 70 meters have been recognized.

Production in the Van Stieckle Dome comes from many sands whose aggregate thickness is 150 meters. These sands are fine grained and have a porosity of 15% to 25%. Individual pay sands range from 6 to 25 meters in thickness and are a part of a series of formations some 1,400 meters thick. Production is confined to a narrow zone 400-1500 meters long and 100-250 meters wide adjacent to the fault. Down dip, the pay sands are water bearing. In 1946 some wells were making water and some oil sands had become completely flooded. Prospects for new discoveries are not promising. The usual production procedures consisted of producing the lowest sands first and then progressively higher zones as the lower ones went to water.

(2) Flysch Ridge.

The Flysch Ridge is the principal feature of the central and western parts of the St. Ulrich-Kuskirchen Field. The structure of this east-west trending ridge is not fully understood. The strata of the ridge are known to dip steeply and consist of dark gray and variegated marl, shale, hard sandy limestone, and lenses of porous sandstone. Fossils indicate the age to be Eocene, but Upper Cretaceous is also thought to be present. Other reliable horizon markers are absent and further stratigraphic studies are therefore limited. The top of this ridge is uneven and contains many highs and lows, which are probably the result

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of Middle Miocene erosion. North and south dips along the flanks of the ridge, of  $10^{\circ}$  to  $25^{\circ}$  are known.

The Helvetian Schlier formation rests unconformably on the Flysch Ridge. The basal schlier has a thickness of 100 to 800 meters and consists of conglomerates and breccias derived from the underlying Flysch. Some strata along the lower slopes of the ridge thin toward the crest. Lenses of sandstone in the upper part of this lower series contain important accumulations of petroleum.

The Upper Schlier is mostly hard gray shaly marl with occasional marine fossil horizons. Its structural irregularities are attributed to compaction of its sediments along the irregular crest of the Flysch Ridge and other adjustments. Dips of  $10^{\circ}$  are recognized and some normal faulting is known.

Production of the St. Ulrich-Jhaskirchen Field comes from the basal Schlier and numerous horizons of the Flysch. Production of the Flysch comes from porous glauconitic sandstones and near the top of the Flysch from weathered porous sands known as cave sands. The complex structure of the Flysch has obscured the exact number of producing sands.

The oil-water contact has been located throughout the field at about the same depth and indicates an inter-connection of the reservoirs. Oil saturation along the crest of the ridge and its flanks indicates an oil saturated column of about 100 meters.

The production of the basal schlier comes from two and sometimes a third porous conglomerate which contains sandstone lenses. The middle sandstone lense is the principal producer. It averages 1.2 meters in thickness and produces from

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an area on the north flank of the ridge one by three kilometers. Production south of the ridge comes from the Flysch.

Future possibilities may exist in the Upper Tertiary sands.

d. Zistersdorf Field.

The Zistersdorf Field is located 3 km. north of Zistersdorf and 4.5 km. northeast of Vienna. This field is comprised of two structures, the Goesting Dome and the RAG Dome.

(1) Goesting Dome:

The Goesting structure is a well dome located on the east side of the Steinberg fault. The upper part of the Lower Pliocene strata are slightly arched along the fault. However, with an increase in stratigraphic depth this arching disappears and the strata dip away from the fault at 20°. The deeper Pliocene (Tortonian) formations dip away from the fault at 30°. The structure of the underlying Flysch is unknown.

Most production has been found in the Miocene; several wells which crossed the Steinberg fault produced from the Flysch. Upper Tertiary sands have been productive in narrow zones adjacent to the fault. Down dip these sands carry water which has already flooded some pay sands.

To the north of the Goesting structure, several wells have been drilled in what is known as the Neusiedle area. Only small production was obtained and this was found in the Flysch.

Prospects for additional production in the Flysch and Schlier were not promising. However, some additional discoveries were expected below 3,000 m. in

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1946. There are no indications of new discoveries from this field, but new developments are still considered possible.

(2) R.A.G. Dome.

The R.A.G. Dome is located 1.5 km. southeast of Goesting and 1.5 km. northeast of Zistersdorf. The structure of the R.A.G. Dome is similar to that of the Goesting Dome. The upper Pliocene strata are slightly arched near the fault but commence to dip away from the fault with depth. Deeper formations are inclined at  $38^{\circ}$ . The Steinberg fault here dips southeast at  $50^{\circ}$  near the surface but with depth this inclination reaches  $65^{\circ}$ . Subsidiary faulting is unreported in the R.A.G. Dome.

Production has been found in the Upper Miocene where pay zones averaged 6 meters. These pay zones were water bearing and in 1946 most wells were producing some water.

Future prospects probably exist at depth of 3000 to 3500 meters in the Upper Middle Miocene.

e. Itag Fields.

The Itag Fields are located in the same general area as the other Austrian Fields; however their size, characteristics and exact location are not definitely known. There are no geological or engineering data available for them.

f. Mustrank Field.

The Mustrank Field is located 4 km. northwest of Zistersdorf and 2 km. each of Mustrank. This field is sometimes referred to as the Kreuzfeld field. Production of 576 shallow wells are included with the Mustrank field.

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The Haustrenck Field is located near the south end of the Steinberg series dome. The stratigraphy consists of the following:

- (1) Upper Middle Miocene (Tortonian) sand, and marl 450 to 475 meters thick.
- (2) Schlier (Miocene) shaly marl and a lower basal conglomerate, 500 meters.
- (3) Eocene (Flysch) at 1000 meter depth which dips northwest at 20°.

The Upper Middle Miocene (Tortonian) and Schlier dip gently to the northwest.

The Flysch is arched less than in the St. Ulrich-Hauskirchen Field. Some faulting has been recognized in the southern part of the field.

Production comes from the lower members of the Schlier where sandstone lenses and conglomerates are oil bearing. The pay-zones are 20 to 30 meters thick, have low porosity, and contain edge waters which exert pressure against the oil. To the southeast these productive horizons carry marl and have practically no reservoir capacity. The discovery of new oil bearing zones is unlikely.

#### 2. Hohenrappersdorf Field.

The Hohenrappersdorf Field is located where the Steinberg fault trends sharply southwest. The field is on the east side of the fault.

The structure of the field is like that of the Gaiselberg field, both transverse and parallel faults being present.

Production was found in the Upper Miocene and shows in the Upper Tertiary; however, the latter zones were never produced. Gas has also been reported from the Tertiary.

No reliable data are available concerning the reserves of this field, but prospects exist in deeper sands.

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The administration of Austrian oil fields is directed by the Soviet Mineral Oil Administration (S.M.V.). This organization was formed by the USSR after the capture of the oil fields in 1945. Since that time all petroleum activities have been directed through this organization. The only known exception is the comparatively new discovery at Gänserndorf in 1950 which is reported to be under the direct control of Moscow.

The aim of the S. M. V. has been to increase Austrian output as rapidly as possible and so all production facilities have been ruthlessly exploited. 12/ Considering the mass dismissals of 1950 13/ and the tightening of security regulations in November 1951 14/, it appears that the S. M. V. has had considerable resistance from oil-field personnel. There is the possibility that the Van Siclie firm was able to deliberately restrict production 15/ in the summer of 1951.

a. Drilling Equipment.

Equipment is not a problem for the S. M. V. for Austrian firms such as Mannesmann-Trouzel supply drilling equipment and diesel engines 12/ of their own manufacture. The equipment is of high quality. Drill pipe and tubing comes from other European satellites.

c. Type of Austrian Crude Oil.

The crude oils from the Vienna Basin are fairly high grade and have a low sulfur content. Both asphaltic and paraffinic crudes are present. Some of the latter have a sufficiently high paraffin content to cause wells to be shut down for cleaning out.

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