E-ISSN: 2664-603X
P-ISSN: 2664-6021
IJPSG 2025; 7(3): 124-128
www.journalofpoliticalscience.com
Received: 16-01-2025
Accepted: 19-02-2025

Alexander Brodt
MLTS Group of Kairos Development International Inc., Oakland Av. Pontiac, MI 48324 USA

Corresponding Author:
Vivek Kumar
Research Scholar, Department of Political Science, School of Liberal Education, Galgotias University, Greater Noida, Uttar Pradesh, India

Capabilities of the present-day mining and chemical engineering to affect global political processes

Alexander Brodt

DOI: https://doi.org/10.33545/26646021.2025.v7.i3b.471

Abstract
The dependence of oil importing countries on oil supplies from the Persian Gulf countries can be overcome by using the latest achievements in mining and chemical engineering, which consist of developing fundamentally new processes for liquefying coal in underground conditions. This approach ensures that artificial oil is produced at a lower cost than natural oil. Such technological processes are technically impossible in surface conditions. However, there are no technical obstacles to their implementation in coal and shale mines.

Keywords: Coal liquefaction, synthetic oil, underground conditions

Introduction
The development of global political processes around the world, in contrast to the logic of science and technology evolution, is based on aiming at different objectives.
While the fundamental science is aimed at the cognition of the surrounding world, and the technology seeks engineering means for using scientific knowledge for applied purposes, the foreign policy of the participants of such "competition" is directed at the establishment of world order expressing interests of one or another state in the "game space".
Meanwhile, the formation of their foreign policy on the world arena by each of such "players" is not always oriented at social and economic welfare of the population of their own countries, being sometimes aimed, unfortunately, at the usurpation of full authority in the hands of only one "captain" of such a "crew".
In this case, the activities of such authority are aimed at a criminal use of wide sections of the population in the capacity of "consumables", so that just another "leader of nation" ("father of nations", "great pilot", "spokesman of people's interests", "defender of the oppressed", "leader of Islamite revolution", "beloved chief", etc.) could achieve his personal and sometimes even maniacal purposes, and not at the support of interests of overwhelming majority of fellow-citizens.
As a result, the world arena becomes a field of conflict of interests, where each party tries to impose its "rules of game" on the rival using methods that are not always purely "sportive".
As a result, international tension is growing, economic situation becomes destabilized, and common crisis phenomena around the world are aggravated.
Moreover, military expenditure for curbing one or another "player" reaches gigantic amounts, which negatively affects the solution of other, peaceful problems.
Recent tragic events in Syria visually demonstrate polar interests of different states regarding the outcome of such violent internal confrontation. The point is that petroleum prices on the world market will depend in many respects on which of the rivals will be the most successful at this murderous "ring".
Respectively, principal oil-producing countries (and, first of all, Russia, which does not pay proper attention to overcoming its lag in high-tech branches of economy) "play up" to those participants, whose victory promises a rise in oil prices. On the contrary, oil-purchasing countries, whose financial well-being falls with growing tension in intergovernmental relations and respective heating up of the world market of energy carriers, contribute to the success of those "players" of Syrian "match", whose victory entails oil price cutting.
In this sense, mining and chemical engineering have accumulated a wealth of experience of serving various political forces during all their history.

Such forces skillfully exploit the progress of technical thought for attaining their goals, especially related to the access to various mineral and energy resources.

A classical historical example is nazi Germany in the year 1933. Recall that it was Germany that became the motherland of coal liquefaction in the beginning of the XX century.

As early as 1913, precisely 100 years ago, a great German chemist Friedrich Bergius was the first in the world to obtain artificial liquid fuel from coal in laboratory conditions.

The idea of the method consisted in catalytic hydrogenation of coal under the action of hydrogen at high temperature and high pressure. In 1931, Bergius was awarded the Nobel prize in chemistry for his "merits in the introduction and development of a high-pressure method in chemistry".

However, this success of chemical synthesis could remain a purely scientific achievement unless Adolph Hitler came to power in Germany in 1933. He understood that a new Eastward campaign would be impossible, unless the problem of the supply of the army and fleet with their own combustive-lubricating materials was not solved.

Thus, the professionalism and inventiveness of numerous outstanding German chemical engineers and designers of chemical equipment in nazi Germany proved to be extremely relevant. They were the first to provide engineering approach to this unique technological process and master it on an industrial scale.

As a result, 18 plants for coal hydrogenation (with 95 000 employees), which liquefied annually 50 million tons of lignite and 10 million tons of coal, were built in the Third reich. This allowed fascist Germany unhindered unleash the Second World War and conduct military operations until 1945. 92% of aviation petrol consumed by Luftwaffe were of synthetic origin.

Indeed, such artificial fuel was about 10 times more expensive than natural liquid fuel obtained from natural oil. Therefore, one of the main goals of the Eastward campaign was the capture of Baku oilfields at the Caspian sea, which represented in that period the main source of raw materials for producing all kinds of motor fuels supplied to the Red Army and Fleet.

Clearly, the capture of Baku oilfields in 1942 by Hitler could have been a catastrophe for Stalin, who had never aimed (before WW2) at the problem of creating the industry of artificial liquid fuel in the USSR.

In the modern epoch, the attention of professional politicians has been attracted to the problem of coal liquefaction more than once, e.g., after October 17, 1973, when Egypt and Syria declared during the October war at the Middle East that they would not supply oil at former prices to the countries that supported Israel in this conflict.

This unprecedented economic pressure concerned primarily the USA and their allies in Western Europe, who were not ready at all for such a turn. In contrast to South Africa, which was forced to follow the path of industrial production of artificial fuel since long ago (because of oil delivery sanctions introduced by the world community against the apartheid system), these countries had no tool whatever, which could resist such an impudent blackmail.

As a result, oil price rose 4 times (from 3 to 12 $USA for barrel) within several day. This made Western governments activate researches in the field of coal processing into artificial liquid fuel. At the same time, the construction of new atomic power stations got a powerful impulse.

40 years have passed since then. However, the situation in the Middle East is still far from being quiet. Respectively, the prices of oil at the world market are still steadily growing and remain at an incomparably higher level than during the Second World War or oil crisis of the 70s.

On the other hand, nuclear tragedy of Chernobyl and Fukushima disaster led to an obvious apathy with respect to atomic power engineering all over the world.

Note that only 2% of integral coal resources have been exhausted by today (for comparison, 85% of total oil resources in the world have been already exhausted).

Therefore, it is no wonder that efforts aimed at the search for more perfect methods of coal liquefaction are activated again-primarily, in the countries whose economy permanently suffers from high oil prices at the world market.

The greatest recent achievement in this direction is the largest, on a global scale, plant producing artificial liquid fuel constructed in China (Shenhua DCL Project, Inner Mongolia). The analysis of prime cost of finished product of this plant shows that about a half of all expenses in the total structure of its production costs falls on coal purchase and transportation to the liquefaction spot.

All this suggests a conclusion that new ways of cardinal reduction of underground mining price are needed, coupled with a complete denial of drawing coal (produced at a much lower price) to the ground surface and usage of highly efficient and compact methods of its underground processing into artificial oil in the immediate vicinity of the mining face.

We propose such a method of coal production with its subsequent underground liquefaction.

The use of the proposed power-saving and ecologically clean method in coal-mining industry for producing artificial liquid fuel from cheaper coal in underground (and not ground-based) conditions contributes to an essential improvement of technical and economic efficiency of such processing of combustible mineral, especially if it is characterized by an elevated content of incombustible mineral admixtures.

At the same time, multipurpose use of the produced coal (at the expense of accompanying methane extraction from the initial raw material) is attained, and liquefaction becomes more complete (due to the supply for hydrogenation of super-high purity coal concentrate thoroughly impregnated, besides, by a hydrogenation catalyst). This essentially decreases the specific consumption of the initial raw material per each ton of the obtained liquid product.

At that, harmful effect of underground mining and artificial liquid fuel production of the natural environment considerably weakens, since all final tailings of coal beneficiation and solid waste of artificial liquid fuel production remain in the underground worked-out space.

Besides, the denial of drawing crude solid fuel from coal mines to the ground surface and shipping the ready product in the form of artificial oil obtained in underground conditions, make it possible not only to abolish from the mine economy such powerful electric power consumers as rope-skip hoists (the power of modern mine hoists reach 15,000 kW) and coal-beneficiation factories (total electric power of the drives of all kinds of basic technological equipment installed at such ground-based production units can reach 10,000 kW), but also to wholly reject the services

of railway transport.

In this case, it is much more profitable to deliver the production to its destination by pipeline transport, which is about three times cheaper than coal transport by railway (not to mention mechanical losses of solid fuel due to coal dust blowing out of railway cars by wind).

Such proposal is of special interest for developing deep and extra-deep deposits of energy minerals. For instance, today the record depths reached by modern coal-mining industry are close to 2000 meters. Coal liquefaction at such extreme depths automatically leads to the working pressure growth in the zone of its hydrogenation up to 21 ÷ 22 MPa (without bringing in any power inputs from outside). This significantly intensifies such underground technological process and drastically facilitates the conversion of even the most coalified kinds of combustible minerals into artificial oil.

However, according to today's geological data, coal series cover much greater depths. This fact opens prospects of developing these huge supplies of energy minerals for converting mining from coal (solid fuel) production to ecologically clean production of synthetic liquid fuel instead.

With deepening level of underground mining, a steady growth of the bearing strata temperature allows a considerable increase in the share of free heat of the interior of the Earth in the total energy balance of such technological process.

We cannot ignore the fact that the saturation of coal and bearing strata with methane with growing coal seam depth also drastically increases. In this connection, the possibility of complex usage of the energy potential of the produced raw mineral by simultaneous methane extraction assured by the proposed method, also advantageously distinguishes said method from known technologies of solid fuel processing into alternative energy carriers.

A significant contribution to the profitability of underground coal liquefaction in comparison with ground-based production of artificial liquid fuel is due to a reduced hydrogen demand, since energy minerals freshly produced from the mining face are immediately isolated from the mine atmosphere by liquid medium. Thus, since the very beginning of coal separation from the mining face, air oxygen automatically loses contact with the coaly component of the combustible mineral and triggers the mechanism of its irreversible endogenic oxidation.

On the whole, the main advantage of the proposed technological process is a steady growth of technical and economic efficiency of underground coal liquefaction with growing depth of coal production. Meanwhile, in a conventional approach to the production of artificial liquid fuel with coal liquefaction system located on the ground surface, far from coal supplier, deepening of underground mining, on the contrary, leads to an irreversible growth of the prime cost of the obtained artificial liquid fuel and to the growth of harmful effect of such human industrial activity on the natural environment.

Thus, the political governing body of any coal-producing country around the world (China, USA, Canada, India, Australia, Russia, Ukraine, Poland, Kazakhstan, Indonesia, South Africa, Germany, Great Britain, Turkey, etc.) gets direct technical means of producing artificial oil at minimum a twice lower price (on the order of 27÷45 $ US for barrel) than that of a barrel of natural oil produced at the Middle East and in the Persian gulf countries.

It is clear that in this case, political leaders of the main coal-producing countries and, first of all, of the USA, acquire a powerful tools for a civilized pressure on Arab oil-producing circles. Thus, the latter lose the opportunity of easily getting the West by the throat at any aggravation of political situation at the Middle East and all over the world.

The development of global political processes around the world, in contrast to the logic of science and technology evolution, is based on aiming at different objectives.

While the fundamental science is aimed at the cognition of the surrounding world, and the technology seeks engineering means for using scientific knowledge for applied purposes, the foreign policy of the participants of such "competition" is directed at the establishment of world order expressing interests of one or another state in the "game space".

Meanwhile, the formation of their foreign policy on the world arena by each of such "players" is not always oriented at social and economic welfare of the population of their own countries, being sometimes aimed, unfortunately, at the usurpation of full authority in the hands of only one "captain" of such a "crew".

In this case, the activities of such authority are aimed at a criminal use of wide sections of the population in the capacity of "consumables", so that just another "leader of nation" ("father of nations", "great pilot", "spokesman of people's interests", "defender of the oppressed", "leader of Islamite revolution", "beloved chief", etc.) could achieve his personal and sometimes even maniacal purposes, and not at the support of interests of overwhelming majority of fellow-citizens.

As a result, the world arena becomes a field of conflict of interests, where each party tries to impose its "rules of game" on the rival using methods that are not always purely "sportive".

As a result, international tension is growing, economic situation becomes destabilized, and common crisis phenomena around the world are aggravated.

Moreover, military expenditure for curbing one or another "player" reaches gigantic amounts, which negatively affects the solution of other, peaceful problems.

Recent tragic events in Syria visually demonstrate polar interests of different states regarding the outcome of such violent internal confrontation. The point is that petroleum prices on the world market will depend in many respects on which of the rivals will be the most successful at this murderous "ring".

Respectively, principal oil-producing countries (and, first of all, Russia, which does not pay proper attention to overcoming its lag in high-tech branches of economy) "play up" to those participants, whose victory promises a rise in oil prices. On the contrary, oil-purchasing countries, whose financial well-being falls with growing tension in intergovernmental relations and respective heating up of the world market of energy carriers, contribute to the success of those "players" of Syrian "match", whose victory entails oil price cutting.

In this sense, mining and chemical engineering have accumulated a wealth of experience of serving various political forces during all their history. Such forces skillfully exploit the progress of technical thought for attaining their goals, especially related to the access to various mineral and energy resources.

A classical historical example is nazi Germany in the year 1933. Recall that it was Germany that became the motherland of coal liquefaction in the beginning of the XX century.

As early as 1913, precisely 100 years ago, a great German chemist Friedrich Bergius was the first in the world to obtain artificial liquid fuel from coal in laboratory conditions.

The idea of the method consisted in catalytic hydrogenation of coal under the action of hydrogen at high temperature and high pressure. In 1931, Bergius was awarded the Nobel prize in chemistry for his "merits in the introduction and development of a high-pressure method in chemistry".

However, this success of chemical synthesis could remain a purely scientific achievement unless Adolph Hitler came to power in Germany in 1933. He understood that a new Eastward campaign would be impossible, unless the problem of the supply of the army and fleet with their own combustive-lubricating materials was not solved.

Thus, the professionalism and inventiveness of numerous outstanding German chemical engineers and designers of chemical equipment in nazi Germany proved to be extremely relevant. They were the first to provide engineering approach to this unique technological process and master it on an industrial scale.

As a result, 18 plants for coal hydrogenation (with 95 000 employees), which liquefied annually 50 million tons of lignite and 10 million tons of coal, were built in the Third reich. This allowed fascist Germany unhindered unleash the Second World War and conduct military operations until 1945. 92% of aviation petrol consumed by Luftwaffe were of synthetic origin.

Indeed, such artificial fuel was about 10 times more expensive than natural liquid fuel obtained from natural oil. Therefore, one of the main goals of the Eastward campaign was the capture of Baku oilfields at the Caspian sea, which represented in that period the main source of raw materials for producing all kinds of motor fuels supplied to the Red Army and Fleet.

Clearly, the capture of Baku oilfields in 1942 by Hitler could have been a catastrophe for Stalin, who had never aimed (before WW2) at the problem of creating the industry of artificial liquid fuel in the USSR.

In the modern epoch, the attention of professional politicians has been attracted to the problem of coal liquefaction more than once, e.g., after October 17, 1973, when Egypt and Syria declared during the October war at the Middle East that they would not supply oil at former prices to the countries that supported Israel in this conflict.

This unprecedented economic pressure concerned primarily the USA and their allies in Western Europe, who were not ready at all for such a turn. In contrast to South Africa, which was forced to follow the path of industrial production of artificial fuel since long ago (because of oil delivery sanctions introduced by the world community against the apartheid system), these countries had no tool whatever, which could resist such an impudent blackmail.

As a result, oil price rose 4 times (from 3 to 12 $USA for barrel) within several day. This made Western governments activate researches in the field of coal processing into artificial liquid fuel. At the same time, the construction of new atomic power stations got a powerful impulse.

40 years have passed since then. However, the situation in the Middle East is still far from being quiet. Respectively, the prices of oil at the world market are still steadily growing and remain at an incomparably higher level than during the Second World War or oil crisis of the 70s.

On the other hand, nuclear tragedy of Chernobyl and Fukushima disaster led to an obvious apathy with respect to atomic power engineering all over the world.

Note that only 2% of integral coal resources have been exhausted by today (for comparison, 85% of total oil resources in the world have been already exhausted).

Therefore, it is no wonder that efforts aimed at the search for more perfect methods of coal liquefaction are activated again-primarily, in the countries whose economy permanently suffers from high oil prices at the world market.

The greatest recent achievement in this direction is the largest, on a global scale, plant producing artificial liquid fuel constructed in China (Shenhua DCL Project, Inner Mongolia). The analysis of prime cost of finished product of this plant shows that about a half of all expenses in the total structure of its production costs falls on coal purchase and transportation to the liquefaction spot.

All this suggests a conclusion that new ways of cardinal reduction of underground mining price are needed, coupled with a complete denial of drawing coal (produced at a much lower price) to the ground surface and usage of highly efficient and compact methods of its underground processing into artificial oil in the immediate vicinity of the mining face.

We propose such a method of coal production with its subsequent underground liquefaction.

The use of the proposed power-saving and ecologically clean method in coal-mining industry for producing artificial liquid fuel from cheaper coal in underground (and not ground-based) conditions contributes to an essential improvement of technical and economic efficiency of such processing of combustible mineral, especially if it is characterized by an elevated content of incombustible mineral admixtures.

At the same time, multipurpose use of the produced coal (at the expense of accompanying methane extraction from the initial raw material) is attained, and liquefaction becomes more complete (due to the supply for hydrogenation of super-high purity coal concentrate thoroughly impregnated, besides, by a hydrogenation catalyst). This essentially decreases the specific consumption of the initial raw material per each ton of the obtained liquid product.

At that, harmful effect of underground mining and artificial liquid fuel production of the natural environment considerably weakens, since all final tailings of coal beneficiation and solid waste of artificial liquid fuel production remain in the underground worked-out space.

Besides, the denial of drawing crude solid fuel from coal mines to the ground surface and shipping the ready product in the form of artificial oil obtained in underground conditions, make it possible not only to abolish from the mine economy such powerful electric power consumers as rope-skip hoists (the power of modern mine hoists reach 15,000 kW) and coal-beneficiation factories (total electric power of the drives of all kinds of basic technological equipment installed at such ground-based production units can reach 10,000 kW), but also to wholly reject the services of railway transport.

In this case, it is much more profitable to deliver the production to its destination by pipeline transport, which is

about three times cheaper than coal transport by railway (not to mention mechanical losses of solid fuel due to coal dust blowing out of railway cars by wind).

Such proposal is of special interest for developing deep and extra-deep deposits of energy minerals. For instance, today the record depths reached by modern coal-mining industry are close to 2000 meters. Coal liquefaction at such extreme depths automatically leads to the working pressure growth in the zone of its hydrogenation up to 21 ÷ 22 MPa (without bringing in any power inputs from outside). This significantly intensifies such underground technological process and drastically facilitates the conversion of even the most coalified kinds of combustible minerals into artificial oil.

However, according to today's geological data, coal series cover much greater depths. This fact opens prospects of developing these huge supplies of energy minerals for converting mining from coal (solid fuel) production to ecologically clean production of synthetic liquid fuel instead.

With deepening level of underground mining, a steady growth of the bearing strata temperature allows a considerable increase in the share of free heat of the interior of the Earth in the total energy balance of such technological process.

We cannot ignore the fact that the saturation of coal and bearing strata with methane with growing coal seam depth also drastically increases. In this connection, the possibility of complex usage of the energy potential of the produced raw mineral by simultaneous methane extraction assured by the proposed method, also advantageously distinguishes said method from known technologies of solid fuel processing into alternative energy carriers.

A significant contribution to the profitability of underground coal liquefaction in comparison with ground-based production of artificial liquid fuel is due to a reduced hydrogen demand, since energy minerals freshly produced from the mining face are immediately isolated from the mine atmosphere by liquid medium. Thus, since the very beginning of coal separation from the mining face, air oxygen automatically loses contact with the coaly component of the combustible mineral and triggers the mechanism of its irreversible endogenic oxidation.

On the whole, the main advantage of the proposed technological process is a steady growth of technical and economic efficiency of underground coal liquefaction with growing depth of coal production. Meanwhile, in a conventional approach to the production of artificial liquid fuel with coal liquefaction system located on the ground surface, far from coal supplier, deepening of underground mining, on the contrary, leads to an irreversible growth of the prime cost of the obtained artificial liquid fuel and to the growth of harmful effect of such human industrial activity on the natural environment.

Thus, the political governing body of any coal-producing country around the world (China, USA, Canada, India, Australia, Russia, Ukraine, Poland, Kazakhstan, Indonesia, South Africa, Germany, Great Britain, Turkey, etc.) gets direct technical means of producing artificial oil at minimum a twice lower price (on the order of 27÷45 $ US for barrel) than that of a barrel of natural oil produced at the Middle East and in the Persian gulf countries.

It is clear that in this case, political leaders of the main coal-producing countries and, first of all, of the USA, acquire a powerful tools for a civilized pressure on Arab oil-producing circles. Thus, the latter lose the opportunity of easily getting the West by the throat at any aggravation of political situation at the Middle East and all over the world.

References

1. Brodt A. Processing combustible material methods and systems, US Patent 9,447,331 B2, Patented on 20 Sept. 2016.
2. Moody R. Rocks and hard places: The globalization of mining. Zed Books; 2007.
3. Rosenberg N. Chemical engineering as a general purpose technology. General purpose technologies and economic growth. 1998;315.
4. Lynch M. Mining in world history. Reaktion Books; 2002.
5. Panagopoulos A. Brine management (saline water & wastewater effluents): Sustainable utilization and resource recovery strategy through Minimal and Zero Liquid Discharge (MLD & ZLD) desalination systems. Chemical Engineering and Processing-Process Intensification. 2022 Jun 1;176:108944.