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Abstract
According to analysed oil reserves and oil production worldwide during 1995, 2005 and 2015, a global increase in oil reserves is observed. In 1995, there were 179.1 × 10⁹ m³, in 2005 there were 218.5 × 10⁹ m³ and in 2015 there were 269.9 × 10⁹ m³ oil reserves. According to British Petroleum data, oil production is also increasing, but by a smaller ratio. Oil production in the world in 1995 was 10.8 × 10⁹ m³, in 2005 it was 13.0 × 10⁹ m³, and in 2015 14.6 × 10⁹ m³. Oil price trends between 1980 and 2015 were analysed. Many different causes affect the constant oil price fluctuations, but the most influential are the geopolitical crises of the Middle Eastern countries, as well as a great increase in demand for oil and the expansion of the consumption of wealthy countries such as China, India and Brazil, which was not accompanied by a corresponding increase in supply. Modern political relations are full of conflicts, which greatly affect oil prices, and the best example is the short-term rise in oil prices in 2011, when armed conflicts started in Libya, or disablement of production in countries such as Syria and Yemen, which in 2015 can barely capture any production. By comparing reserves, earnings and oil price fluctuations, it is apparent that almost every increase in oil production, after the discovery of oil deposits, was later accompanied by a fall in prices.

Keywords:
oil reserves, oil production, oil prices, oil consumption

1. Introduction
Oil and gas reserves are one of the most precious forms of energy that mankind today possesses, and the management of energy mineral resources is one of the most important factors in the development of each country. Oil and natural gas are the main energy mineral resources and make 60 to 80 % of total energy consumption in most countries. Sudden price changes of oil and other petroleum products through history show that oil price fluctuation is unpredictable and constant estimates of reserves are necessary as well as adjusting strategies for oil exploration. Energy consumption in the ‘90s of the 20th century gradually and moderately increased, and more intense growth was achieved in the early 21st century. With growth in energy consumption, the demand for oil is also growing and oil has become extremely significant for the industry, and its possession is a prerequisite for further development of the economy of an individual country.

Throughout the history of hydrocarbon exploration, geologists encountered the problem of oil reserves limit as well as their exploitation. In 1956, Marion King Hub-
feasible obtained at a given moment (Velić et al., 2015). According to BP data from 2015, in the Middle East there is 47.3% of oil reserves followed by South and Central America with 19.4% and North America has 14.0% reserves. Europe has less than 10% of oil reserves and Eurasia has 9.1%. Of the total oil reserves, 7.6% is located in Africa and 2.5% in Asia and the Pacific while the remaining countries have only 0.1% of the total amount of oil reserves in the world (see Figure 1).

Oil capture involves two different, but closely related general systems. These are the field, which represents a natural porous space with features for storing and flowing fluid and artificial creation, which includes a well,
depth and surface equipment of the well, surface collecting system and equipment for separating and storing fluid. The field supplies a well with oil which with its depth and surface equipment allows oil to flow from the bottom of the well to the surface and allows for oil flow control (Čípek, 2015).

Oil capture is not proportional to the amount of proven reserves owned by an individual country. Figure 2 shows the distribution of oil production in the world during 1995, 2005 and 2015. Oil production in 1995 amounts to $10.8 \times 10^9$ m$^3$, in 2005 oil production was $13 \times 10^9$ m$^3$, and in 2015 was $14.6 \times 10^9$ m$^3$ (BP, 2016). The reason for the steady increase in oil production can be attributed to increased oil demand in the market because of the needs of the world economy. In the last twenty years, rapid development of the industry has been recorded as well as a rise in global traffic. Saudi Arabia and South and Central America have the most significant growth in production over the years, while Asia and the Pacific and Europe recorded the largest fall in oil production.

2.1 North America

North America has 14 % of oil reserves, the United States owns 3.2 % or $8.7 \times 10^9$ m$^3$ of total oil reserves, Canada 10.1 % or $27.4 \times 10^9$ m$^3$, and Mexico 0.6% or $1.7 \times 10^9$ m$^3$ (see Figure 3).

In global oil production in 2015, North America has been involved with 20.9 %, whereby the United States exploits the most significant quantities, 13 % or $2.020 \times 10^9$ m$^3$. Comparing oil reserves and oil production in the United States, it can be concluded that production is not sustainable for a longer period of time, but year after year the quantities of exploited oil compensate themselves by new reserves.

Compared to 1995 when the US oil production gained $1.323 \times 10^9$ m$^3$, in 2005, production has fallen slightly and it was $1.097 \times 10^9$ m$^3$ (see Figure 4). Oil exploration in the remaining countries of this region, Canada and Mexico, is much smaller than in the United States, so in 2015, Canada had gained $0.697 \times 10^9$ m$^3$ or 4.9 % of oil, and Mexico $0.411 \times 10^9$ m$^3$ or 2.9 %.

One of the most significant oilfields in the United States is Prudhoe Bay, discovered in 1967 within the same basin (Yergin, 1990). The field is an anticline structure located on Barrow Arch, with faulting on the north side of the arch and a Lower Cretaceous unconformity on the east side (Sweet, 2008). The basin is located within the Sadlerochit, Shublik and Sag River formations (Van Poollen et al., 1974). The porosity is
about 25% and the permeability is around 0.270 m² (Jamison et al., 1980).

The next important oilfield in the United States is East Texas located within the Cretaceous-age Woodbin Formation (Denne et al., 2016). The type of trap for hydrocarbons is stratigraphic. The source rock for the oil in East Texas is the overlying Eagle Ford Shale.

The Spraberry Trend, also known as the Spraberry Field is a large oilfield in the Permian Basin of West Texas. All oil is produced from a single enormous sedimentary unit known as the Spraberry Sand, which consists of complexly mixed fine sandstone and calcareous or silicate mudstone and siltstone, deposited in a deep water environment distinguished by channel systems and their associated submarine fans, all of Permian age. Oil has accumulated in stratigraphic traps (Wikipedia, 2018).

Canada is rich in hydrocarbons from an unconventional petroleum deposit, so-called oil sands. Estimated oil reserves in these deposits were determined in 2007 on the level of 1127.13 × 10⁸ m³, and more than 95% of these reserves are located in the province of Alberta within the Sandstones from the Athabasca formation (Velić et al., 2015).

Two large oilfields are located in Mexico, Cantarell, which at the end of the last decade was the second largest field for exploitation, and Chicontepec, which is considered as an unconventional oilfield (Velić et al., 2015).

During the Cretaceous asteroid Chicxulub impactor hit the ground and it created the Chicxulub crater and subsequent carbonate-debris breccia, which became the oil reservoir (Barton et al., 2010). There are four blocks in the Cantarell Complex, Akal, Nohoch, Chac and Kutz (Acevedo, 1980).

2.2 South and Middle America

South and Central America own almost 20% of the world’s oil reserves, of which only 17.7% or 47.8 × 10⁹ m³ of oil is in Venezuela according to 2015 data, which holds the primacy in reserves. Venezuela, with the large amounts of proven reserves of oil in conventional reservoirs, has significant reserves in unconventional deposits. Brazil has 0.8% or 2.1 × 10⁹ m³ of oil and Ecuador 0.5% or 1.3 × 10⁹ m³. The remaining countries have less than 1% of the world’s oil reserves. Those are Argentina and Colombia with 0.1% or 0.4 × 10⁹ m³, Peru with 0.1% or 0.2 × 10⁹ m³, and with less than 0.1% in the total world reserves, Trinidad and Tobago, 0.1 × 10⁹ m³ (see Figure 5).

According to BP data from 2015, in the world’s total oil production South and Central America participate...
with 9.1 % or 1.226 × 10^9 m³. Oil production in Venezuela was 3.1 % or 0.417 × 10^9 m³ followed by Brazil, 3 % or 0.402 × 10^9 m³ and Columbia, 1.2 % or 0.160 × 10^9 m³. Argentina and Ecuador recorded a production of 0.7 % or 0.101 × 10^9 m³, 0.086 × 10^9 m³ respectively. The lowest production was achieved in Peru and Trinidad and Tobago. It was about 0.017 × 10^9 m³ or 0.1 % (see Figure 6).

In Venezuela, oil was discovered at the beginning of the 20th century in jungles around the lake Maracaibo at a time when Venezuela was a rarely populated agricultural land with the key influence of the military in land management at all levels (Dekanić et al., 2004). In early 2011, President Hugo Chavez and the government announced that oil reserves in Venezuela are greater than in Saudi Arabia, and according to BP data, they are over 47.8 × 10^9 m³. The largest oilfield in Venezuela is Bolivar Coastal which was discovered in 1917. 94 % of hydrocarbon reservoirs in the Maracaibo Basin are found within Eocene-Miocene clastic rocks (Talukdar and Marcano, 1994). The biggest production was achieved within the Trujillo and Musso formation, Eocene Age and La Rosa and Lagunillas, Miocene age. The accumulation of oil within the Miocene part of the reservoir happens in structural traps, while both, structural and stratigraphic traps are present within the Eocene (Borger and Lenert, 1959).

Another significant oil reservoir in Brazil is the field Lula or Tupi, which was discovered relatively recently, in 2006. The field was discovered in the geological formation known as Pre-salt.

2.3 Europe and Eurasia

The largest reserves of Europe and Eurasia in 2015 are in the Russian Federation, 6 % or 16.3 × 10^9 m³. European oil reserves are located mostly in the North Sea, where Norway and the United Kingdom have the largest share. Norway owns 0.5 % or 1.3 × 10^9 m³ of the world’s oil reserves, while the United Kingdom has 0.2 % or 0.4 × 10^9 m³ of oil reserves. In Kazakhstan, there are 1.8 % or 4.8 × 10^9 m³ of oil reserves, in Azerbaijan 0.4 % or 1.1 × 10^9 m³, while the remaining countries within Europe and Eurasia have much less reserves, about 0.1 × 10^9 m³ (see Figure 7).

In 2015, the Russian Federation produced 12.4 % or 1.746 × 10^9 m³ of oil, while total production in this region amounts 19.4 % or 2.776 × 10^9 m³. Also, Norway has significant production in that year, 0.310 × 10^9 m³ or 2 %, Kazakhstan, 0.265 × 10^9 m³ or 1.8 % and the United Kingdom, 0.153 × 10^9 m³ or 1 %. However, it should be
emphasized that the United Kingdom recorded a significant drop in production. During 1995, it was $0.437 \times 10^9$ m$^3$ and 2005 $0.93 \times 10^9$ m$^3$. During the reference years, Azerbaijan recorded a significant increase in production, so in 2015, it was 1 % or $0.134 \times 10^9$ m$^3$ in the global oil exploitation. There is also Turkmenistan with 0.3 % or $0.041 \times 10^9$ m$^3$, Denmark with $0.025 \times 10^9$ m$^3$ or 0.2 %, Italy with $0.018 \times 10^9$ m$^3$ or 0.1 %, Romania with $0.013 \times 10^9$ m$^3$ or 0.1 % and Uzbekistan $0.010 \times 10^9$ m$^3$ or 0.1 % (see Figure 8).

The Republic of Croatia has a rich history in oil and natural gas extraction and processing. Currently around 60% of the needs for gas and 20% of the needs for oil are covered by local extraction which is in decline, and in regards to expectations of increasing demand in the future, it will become necessary to import larger quantities (Velić et. al, 2016). Oil and natural gas have been produced onshore and natural gas also offshore in Croatia. $1.21 \times 10^9$ m$^3$ of natural gas and $0.85 \times 10^9$ m$^3$ of oil have been produced in Croatia in 2017. Despite all efforts for increasing hydrocarbon production, like the implementation of enhanced oil recovery (EOR) projects, production fell by 4.5% in comparison to 2016 (INA 2018). Croatia will certainly need new supply sources especially for natural gas if it wants to keep the high level of natural gas security of supply (Karasalihović et al. 2010, Šučić et al. 2011).

2.4 The Middle East

The largest proven oil reserves, according to data from 2015, are in the Middle East, 47.3 %. "The richest" has been Saudi Arabia with 15.7 % or $42.4 \times 10^9$ m$^3$ of oil. Others include Iran with 9.3 % or oil reserves in the world $25.1 \times 10^9$ m$^3$ and Iraq with 8.4 % or $22.8 \times 10^9$ m$^3$ oil reserves. Kuwait possesses 6 % or $16.1 \times 10^9$ m$^3$ of oil reserves, and the United Arab Emirates 5.8 % or $15.5 \times 10^9$ m$^3$, 4.1 $\times 10^9$ m$^3$ or 1.5 % of the world reserves has belonged to Qatar, and other countries in the Middle East have had less than 1 % of oil reserves. There has been Oman with 0.3 % or $0.8 \times 10^9$ m$^3$, Yemen with 0.2 % or $0.5 \times 10^9$ m$^3$ and Syria with 0.1 % or $0.4 \times 10^9$ m$^3$ oil reserves (see Figure 9).

The Middle East, as the region with the largest reserves of oil, is also the region with the highest oil production with 33 % or $4.785 \times 10^9$ m$^3$ in total world production. Saudi Arabia was the largest producer of oil with $1.910 \times 10^9$ m$^3$ produced oil in 2015. Compared to Saudi Arabia, the remaining countries of the Middle East have far less production. During 1995, Iraq produced $0.084 \times 10^9$ m$^3$, during 2005 it was $0.291 \times 10^9$ m$^3$, and $0.641 \times 10^9$ m$^3$ or
4.5% in 2015, which has made Iraq the country with the highest growth in the world. Following was Iran with production of $0.623 \times 10^9$ m$^3$ or 4.2% in 2015 and the United Arab Emirates with $0.620 \times 10^9$ m$^3$ or 4%. $0.491 \times 10^9$ m$^3$ of oil was produced in Kuwait, which was 3.4% worldwide, and $0.302 \times 10^9$ m$^3$ or 1.8% in Qatar, which has also recorded an increase in production since 1995 up to now. Also, significant production was achieved in Oman, 1.1% or $0.151 \times 10^9$ m$^3$, while Yemen and Syria gained less than 0.05% in 2015 (see Figure 10).

**Ghawar** oilfield (located in the province Al-Ahsi) was discovered in 1948. With 280 km length and 30 km width, it is the largest oilfield in the world and it produces more than half of total oil production in Saudi Arabia. Approximately 60 – 65% of total Saudi oil production between 1948 and 2000 came from Ghawar. There is no more technical information available for this field. Available information is predominantly historical (pre-nationalization), from incidental technical publications, or anecdotal. Reservoir rocks are *Jurassic Arab-D limestones* with exceptional porosity (Velić et al., 2015).

### 2.5 Africa

Africa possesses 7.6% of the world’s total oil reserves. Libya has the most significant reserves, 2.8% or $7.7 \times 10^9$ m$^3$, next is Nigeria with 2.2% or $5.9 \times 10^9$ m$^3$ and Algeria and Angola with reserves of 0.7% or approximately $2.0 \times 10^9$ m$^3$, while Egypt and South Sudan possess 0.2% or $0.6 \times 10^9$ m$^3$. The Republic of Congo and Gabon have 0.1% or $0.3 \times 10^9$ m$^3$ of oil reserves, and Chad, Equatorial Guinea and Sudan 0.1% or $0.2 \times 10^9$ m$^3$, while the lowest oil reserves own Tunisia, 0.1 $\times 10^9$ m$^3$ or less than 0.1% in the world’s oil reserves (see Figure 11).

The biggest production for most of the countries of this region was achieved in 2005 and it was $1.560 \times 10^9$ m$^3$, while in 2015, it was $1.332 \times 10^9$ m$^3$ and the lowest production was in 1995, $1.131 \times 10^9$ m$^3$. Nigeria has the highest production in this region, $0.374 \times 10^9$ m$^3$, or 2.6% in the total world production. In the world’s total oil production, Angola is involved with 2% or $0.289 \times 10^9$ m$^3$, and Algeria with 1.6% or $0.252 \times 10^9$ m$^3$. Libya is the country with the greatest oil reserves in Africa and during 1995 and 2005, it achieved a significant production of $0.229 \times 10^9$ m$^3$ or $0.277 \times 10^9$ m$^3$. However, due to the difficult economic situation and the war in 2011, during 2015 there was a recorded decrease in exploitation of about 75% and it was only $0.069 \times 10^9$ m$^3$. Significant production was made in Egypt, $0.115 \times 10^9$ m$^3$ or 0.8%, Equatorial Guinea, the Republic of Congo and

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**Figure 11:** Oil reserves expressed in $10^6$ m$^3$ in Africa for 1995, 2005 and 2015 (adapted to: BP, 2016)

**Figure 12:** Oil production in Africa during 1995, 2005 and 2015. The gain values are expressed in $10^6$ m$^3$ (adjusted to: BP, 2016)
Gabon participate in the overall oil production with 0.3 % or 0.046 $\times 10^9$ m$^3$, Equatorial Guinea with 0.044 $\times 10^9$ m$^3$, and the Republic of Congo and Gabon with 0.037 $\times 10^9$ m$^3$. According to the BP report from 2016, there is no data for South Sudan production during 1995 and 2005, while in 2015, it amounted to 0.024 $\times 10^9$ m$^3$ or 0.2 %. Following was Sudan with production of 0.017 $\times 10^9$ m$^3$ or 0.1 % in 2015, but that was a decline of 64 % compared to 2005 when it produced 0.047 $\times 10^9$ m$^3$. The countries with the lowest production in this region are Chad with 0.012 $\times 10^9$ m$^3$ of oil and Tunisia with 0.010 $\times 10^9$ m$^3$ of oil, each participating in the global oil production with 0.1 % (see Figure 12).

The Sarir field was discovered in southern Cyrenaica during 1961 and is considered to be the largest oil field in Libya.

2.6 Asia and Pacific

Asia and the Pacific have the lowest oil reserves, only 2.5 %. In 2015, China had reserves of 1.1 % or 2.9 $\times 10^9$ m$^3$, with significant reserves, but less than 0.3 % were India, 0.9 $\times 10^9$ m$^3$, Vietnam, 0.7 $\times 10^9$ m$^3$ and Australia and Malaysia with 0.6 $\times 10^9$ m$^3$. Brunei owned only 0.2 $\times 10^9$ m$^3$, while Thailand had 0.1 $\times 10^9$ m$^3$ of oil reserves (see Figure 13).

Asia and the Pacific in total world production during 2015 participate with 9.1 %. China produced 4.9 % or 0.685 $\times 10^9$ m$^3$. Next were India and Indonesia with a production of 0.9 % in 2015, or 0.139 $\times 10^9$ m$^3$ for India and 0.131 $\times 10^9$ m$^3$ for Indonesia. In comparison with 1995, when Indonesia produced 0.251 $\times 10^9$ m$^3$, and 2005 and oil production of 0.117 $\times 10^9$ m$^3$, Indonesia recorded a significant decline. Malaysia produced 0.110 $\times 10^9$ m$^3$ or 0.7 % oil in 2015, Thailand 0.076 $\times 10^9$ m$^3$, Australia 0.061 $\times 10^9$ m$^3$ and Vietnam 0.058 $\times 10^9$ m$^3$ or 0.4 %. The lowest production in 2015, 0.1 % or 0.020 $\times 10^9$ m$^3$ was in Brunei (see Figure 14).

3. Reserves to Production (R/P) Ratio

The R/P ratio is the number of years during which an individual country or region with today’s exploitation would exhaust the present reserves, assuming that neither the total amount of reserves nor the production of oil are changed. Figure 15 shows the R/P ratio in 2015 in the world. Since both parameters are very variable in practice, the R/P ratio is intended exclusively for an estimation of global oil supply (Dekanić and Karasalihović Sedlar, 2016).
4. The Oil Prices

Energy raw materials are economic goods with their value and price, which depends on their distribution and quantity. The oil market is represented with supply or exploitation of oil on one side and refinery processing or petroleum products consumption on the other (Nosić et al., 2017). When it comes to oil prices in the market, it is thought of the value of oil expressed in USD per barrel at a certain point on a particular market (Dekanić et al., 2004). The minimum oil price is always determined by maximum production costs, increased for profit. The same law applies to the lower oil price limit. This limit will always determine the costs of exploiting the most expensive unit of produced oil. Unlike the minimum oil price, which is determined by the cost of oil production, the maximum price is determined by the consumer’s readiness for oil derivatives (Grubišić, 2009). The value of oil reserves is an indicator for future profit of their production, as well as an indicator for judgment for the future management of energy companies because the value of the reserves enters into the value of the company’s core capital. The production cost of a single oil barrel is the most important component during the determination of profitability of exploitation and it ranges according to both, petroleum properties and drilling methods.

The main crude oil markets in the world are the North Sea, West Africa, the Mediterranean market, the Persian Gulf, the Asian region and the East and West coast of the United States. Depending on the market, there are several markers for crude oil price, such as Dated Brent, Dubai/Fateh, West Texas Intermediate (WTI), Alaska North Slope, (ANS) and Tapis & Minas (Nosić et al., 2017). Figures 16, 17, 18 and 19 show oil price trends of the above mentioned oil types from 1980 to 2015.

In 1979, a gradual rise in oil prices had started, as a result of production and export quotas of OPEC mem-

Figure 15: The R/P ratio in the world in 2015 (adapted to: BP, 2016)

Figure 16: Brent oil price trends from 1980 to 2015 according to BP data (2016)

Figure 17: Dubai oil price trends from 1980 to 2015 according to BP data (2016)
have been the geopolitical and economic crises of oil producers, wars and the huge increase in demand for the most populous countries in the world (such as China, India and Brazil). Oil prices depend primarily on geopolitical conditions, R/P ratio and surpluses of unused refinery capacities and oil reserves (Cerić, 2012). Hence, BP predicts that countries of rapid economic development, China and India, will play the leading role in increasing energy consumption in the coming years. Predictions are that demand for energy will rise 37 % until 2035, i.e. the increase will be 1.4 % per annum. According to BP’s estimates, the oil market will grow by 0.8 % per annum.

5. Discussion and Conclusion

The contemporary world and economy are unimaginable without a constant energy supply. Among the primary forms of energy, the most important are oil and gas, which have almost completely changed human lifestyle.

At the beginning of the 20th century, oil penetrated in energy consumption and became a part of everyday life, economy and politics. Today, it is clear that economic and political power coincides with the main pillars of energy geopolitics. Humanity, however, does not have long-term fixed and secure supplies of energy with regard to the current mode of its use (Topić, 2017).

Although BP’s data shows a global increase in oil reserves, which were $179.1 \times 10^9$ m$^3$ in 1995, $218.5 \times 10^9$ m$^3$ in 2005, and $269.9 \times 10^9$ m$^3$ in 2015, continuing its current use for energy, the oil reserves might disappear within half a century. The reason for this are numerous unconventional oil fields such as those in Alberta, Canada, but those alternatives have not been technologically or commercially suitable for environmentally suitable use, yet. By analysing oil reserves, oil production and movements of oil prices, it can be concluded that almost every increase in oil production, after the discovery of oil deposits, was later accompanied by a decrease in prices. In other words, the discovery of oil would stimulate prosperity, and then the oil price crashes. That decline in oil prices will lead to a fall in production. In addition, political instability and tensions, as well as war threats, have an impact on raising the uncertainty of oil production.

Due to the growing demand and demand of energy, there will be an increase in exploitation capacity, which will result in new research in deeper parts of the Earth’s surface, in the underwater or in polar regions. Most of the world’s future productions are expected in developing countries, because they have the most profitable production capacities and facilities.

6. References


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