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ISSN 0350-350X
GOMABN 47, 6, 479 - 491
Izlaganje sa skupa/Conference Paper
UDK 551.583 : 351.777 : 341.24.001.2 (497.13)

BEFORE AND AFTER KYOTO

Abstract

It has been years since the discussions and proposals on the necessary changes in the Croatian oil industry and legislature on the fuel quality started in order to implement the EU directives. It all comes down to one undeniable conclusion: urgent refinery modernization in Croatia with the exactly stated ending by the year 2010 is necessary. Bringing and executing the EU directives on the fuel quality in many different countries, including the Republic of Croatia, is not altogether a whim, but a logical extension of the environmental protection and preservation activities which started long time ago. From the beginning of the civilization people fight for clean soil, water and air in many different ways, unconsciously and consciously (letting the air into the rooms, window and door installation, chimneys, heating, insulation, sewage and water-supply systems), in an organized or unorganized way.Some important recently organized activities were the Convention for the Protection of the Ozone Layer (Vienna, 1985), the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, 1997), the UN Framework Climate Change Convention (Rio de Janeiro, 1992), the Kyoto Protocol with the UN Framework Climate Change Convention (Kyoto, 1997).

The Montreal Protocol came with the important decision to accept the new technologies in the production of cooling devices, air conditioners and cosmetics and sorting out the countries with ten years application postponement which includes the Republic of Croatia. By the Kyoto Protocol the signatory countries which ratified the agreement in their countries (166) agreed to reduce the greenhouse grass emissions by at least 5 % from those during reference year 1990 by the period 2008-2012. The measures for reaching this goal have been proposed: the use of renewable energy sources, the use of fuels with less carbon, cogeneration, construction of clean and efficient fossil fuel power plants, nuclear energy, storing CO_2 in underground storages.

At the UN Climate Change Conference (Nairobi, 2006.), the additional 3,5 million tons of CO_2 (34,6 million tons in total) was approved for the Croatia which provided the ratification of the Kyoto Protocol, on April 27, 2007 by the Croatian parliament. Nevertheless, this decision was negotiated and it is based on a fact the Republic of Croatia used to have installed energy capacities for its own needs all over former

Yugoslavia and which are not within the Croatian territory anymore. By this fact the Kyoto obligation to reduce the greenhouse gas emissions by 5 % was fulfilled without undertaking any other activities, which would cost $60 million/year. The emissions of particular gases (1996) in the Croatia are presented..

The EU is the biggest promoter of the Kyoto Protocol with its 22 % participation in the total emission. Some countries ratified the Kyoto Protocol (the USA, Australia) since they did not want to dismiss a lot of their employed population, although the USA (and China) are one of the greatest pollutants.

Greenhouse gases

Greenhouse gases and the equivalents of the potential global warming are shown in the Table 1. In the anthropogenic emissions CO_2 participates with 61 % when related to other gases. CO_2 as the most harmful gas is used as a reference for scaling the emissions of other greenhouse gases. In this way we determine the emissions of the equivalent CO_2.

Table 1: Greenhouse gases and the equivalents of the potential global warming

Greenhouse gases	
	Equivalents of the potential global warming
CO_2	1
CH_4	23
N_2O	296
HFC_s (hidrofluorocarbons)	12-12000
PFC_s (perfluorocarbons)	5700-11900
SF_6 (sumphur hexafluoride)	22200
$CFCl_3$, CF_2Cl_2	
In the anthropogenic emissions CO_2 participates with 61 %- when related to other gases	

The comparison of global warming before the Kyoto activities and after undertaking the recommended measures are shown in the Figure 1. The diagram shows that by implementing the Kyoto measures the global warming process has been slowed down when compared to the previous condition, but still the mere implementation of the Kyoto Protocol is not sufficient.

Greenhouse gas emission in the Republic of Croatia

Although the results of the greenhouse gas emission are about ten years old, they still present the situation in Croatia pretty well. Gas emission in 1998 was lower than gas emission in 1990. At first this may seem strange, but if you consider the fact that many factories stopped their production during the 1990's due to the war, being followed by the privatization process with the same consequence, the decrease in the gas emission is logical.

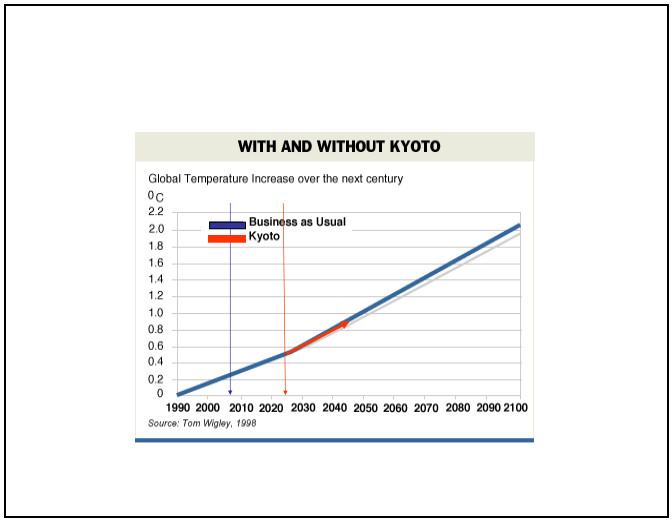

Figure 1: Global warming

In 1996 the SO_2, NO_x and CO_2 emissions in Croatia were 70% lower than in the OECD country members, and the SO_2 emission was 80% lower than in Slovenia and Hungary, which means that Croatia mainly imports SO_2 and NO_x. Our intention is not to point at the potential villain, but we only want to list the facts which are clearly undeniable and unalterable. In other words the wind rose goes like this: winds mostly come from the west and northwest bringing all the atmosphere constituents, including the harmful ones, on the eastern and southeastern areas which are, objectively said, originally cleaner because of the less developed domestic industry. Still this fact does not exclude more poor countries from global environmental protection activities. Another question is the justification of this obligation.

Table 2: Gas emission in Croatia

Gas emission in Croatia, %		
	combustion	traffic
SO_2	92	8
CO_2	63	25
NO_x	35	63
Pb	-	97

The emissions of certain gases (1996) are shown in the Table 2. Table 2 shows that the significant amounts of CO_2 (25%) and NO_x (63%) come from traffic. This tendency is increasing since the vehicle fleet is rapidly growing which directly influences the technological behaviour in the oil industry. New modern production

technologies of low sulphur, low aromatic, low olefin and low volatile fuels have been introduced, but at higher costs.

What does 1t of CO_2 mean?

The density of CO_2 is 1,98 kg/m^3, so we can roughly say that 1 t of CO_2 fills 500 m^3. This gas has a low freezing point (-78,5 ℃), so it is also called dry ice. When it is warmed it directly takes a gaseous state. By special procedures under the high pressure it can be transformed into the liquid state. To clarify it better we will use an already existing example. An Olympic pool is 50 m long, 22 m wide, 1,7 m deep and it's volume is 1870 m^3. For example, vehicle exhaust gases of 190 g of CO_2/km from a car which covers 10.000 km a year produce 1,9 t of CO_2 (950 m^3). In other words, two cars can fill one Olympic pool.

Furthermore, there are approximately 1.700 000 cars in the Republic of Croatia, trucks and mopeds being excluded. With our initial presumptions taken into consideration, they could fill 850 000 pools. The surface of one pool is 1 100 m^2, and the total surface covered by all the cars in Croatia would be 935 km^2, with the layer of 1,7 m. For instance, the city of Zagreb occupies 640 km^2, so the vehicle exhaust emission from cars in Croatia would cover the area of 1,5 Zagreb size.

All the cars would produce 3,2 million tons of CO_2 equivalents in a year, which is an approximate value approved by the Conference in Nairobi (3,5 million tons).

What has been done in the field of fuel quality in Croatia?

The exhaust gas emission from vehicles contributes to the overall environmental pollution and CO_2 emission. It also depends on the quality of fuels. The EU directives, with different levels of application, are implemented in the legislative documents on the fuel quality as it follows:

- The Decree on the liquid oil fuel quality is coordinated with the EU directives
- Lead is not allowed in motor gasoline in the Croatia, 2006.
- The concentration of sulphur in motor fuels is 50 ppm maximum, 2006.
- The import of modern sophisticated vehicles, agricultural and industry machinery with systems for the additional exhaust gases treatment (lambda probes, EGR, turbo filling, common rail)
- The modernization process of the Croatian refineries is already running late and thus it can not comply with the requirements from the Decree.

Limitations

The limitations of the fuel terminology:

- Eurodizel-plavi (Eurodiesel-blue), attributing EURO does not present the announced quality which can mislead consumers (degradation, malfunctions, increased consumption)

(See: Consumer protection law, Act 3, disapproved influence-consumer's limited decision making, Act 17, manufacturer's name of a product-distinction from the similar).

– To be done for practical reasons:
– eliminate the colour and the name
– introduce slip cards for privileged use and registration of certain fuel users (agricultural machinery and fishing boats)

The limitations of the Decree on the liquid oil fuel quality

the quality of the features of the liquid oil fuels not defined by the Decree ("non-ecological") is not determined
criminal provisions are not included in the document, they need to be amended
postponements need to be prolonged even more due to the delay in the process of the modernization of the refineries.
To be done amend the limitations of the Decree (criminal provisions, features, postponements, to be done immediately)

– sulphur in gas oil and fuel oil for use in the households 0,1% m/m (introduced by the Decree by January 1, 2008) – to be postponed and continue with contingents
– sulphur in unleaded motor gasoline and diesel fuels (10 ppm) is to be introduced by January 1, 2009 – to allow contingents for low sulphur fuels
– contingents for unleaded motor gasoline (500 ppm S) and diesel fuels (5000 ppm S) are to be recalled by the Decree by January 1, 2009. – to be postponed
– sulphur in fuel oil 1,0% m/m is to be introduced by the Decree by January 1, 2010. – to be postponed
– biofuels – to be introduced immediately.

The reason for these changes is the fact that the ending of the Croatian refineries modernization process is planned for 2011, which presents a time discrepancy (2 years behind) as it is shown in the Figures 2 and 3.

In 2015 refineries are to invest into these technologies:

– hydrocracking
– residue desulphurization
– or conversion capacities

The subsequent results will be:

– energy consumption increase
– CO_2 emission increase

Diesel fuel production will be increased when compared to unleaded motor gasoline, which leads to the increased CO_2 emission from traffic. The use of biofuels will also be increased which subsequently means the increased NO_x emission.

Refineries will have to pay special attention to the increased CO_2 emission and find the way to comply with the framework of the approved emission.

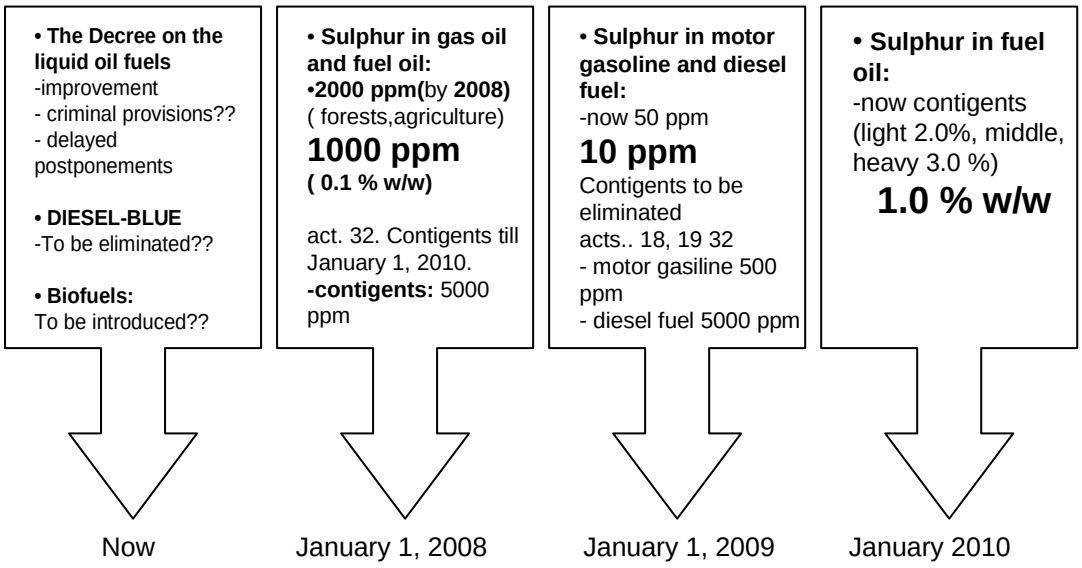

Figure 2: Planned postponements by the existing Decree on the liquid oil fuel quality

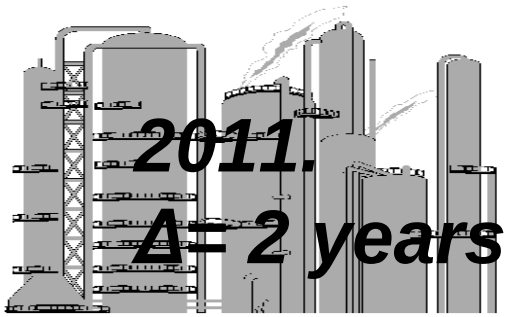

Figure 3: The planned ending of the refinery modernization process in the Croatia

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UDK	ključne riječi	key words
551.583	klimatske promjene	climate changes
351.777	zaštita okoliša, upravno-pravni sustav	environment protection, administrative-legislative system
341.24	međunarodna konvencija Kyoto protokol	international convention Kyoto protocol
.001.2	gledište zahtjeva, uvjeta i provedbe	requirements, preconditions, implementation viewpoint
665.73/.75	tekuće naftno gorivo	petroleum liquid fuel products
(497.13)	Hrvatska	Croatia

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Received

20.10.2008.