

PRODUKCE A VYUŽÍVÁNÍ BIOPALIV V PODMÍNKÁCH SLOVENSKÉ REPUBLIKY

PRODUCTION AND UTILIZATION OF BIO-FUELS IN CONDITIONS OF THE SLOVAK REPUBLIC

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Anotace: Neustále se zvyšující hustota dopravy, která velmi úzce souvisí se zhoršující se kvalitou ovzduší, ale i narůstající ceny ropy, jako i snaha o maximální využívání zemědělské půdy s vysokou bonitou, rozpoutaly v posledních letech zvýšení produkce biopaliv. Výjimkou není ani SR, i když výroba biopaliv na Slovensku zatím významný rozvoj nezaznamenává. Výstavba bioetanolových stanic není levnou záležitostí, využívání obilí na výrobu bioetanolu vede ke zdražování potravin a problémy jsou spojeny také s likvidací odpadů z bioetanolových stanic. Možnosti produkce biopaliv v SR se pokouší shrnout tento článek.

Klíčová slova: Biopaliva, MEŘO, bioetanol, bioplyn

Summary: The density of traffic is still increasing. It is connecting with retrogressive quality of atmosphere but with increasing price of oil too. There is an effort about maximum using of farmland which has a high credit. Previous factors started the increase in production of bio-fuels in last years. The Slovak republic is not the exception although the production of bio fuels didn't note important development. The building of bio ethanol stations isn't cheap. Using of cereals on production of bio ethanol admit to rise the price of food stuff. But problems are with the liquidation of waste from bio ethanol stations. This article tries to summarize the possibilities of bio-fuels production in the Slovak Republic.

Key words: Bio-fuels, FAME, bioethanol, bio-gas

1. INTRODUCTION

Amount of carbon dioxide (CO₂) which is eased into atmosphere in combustion of gasoline and diesel oil from 2000 every year in Slovak Republic is averaged at about more than 5,5 millions tons. Amount of nitrogen oxide (NO_x), carbon monoxide (CO) and volatile organic substances compounds (VOC) [4], [5], [7] is estimated to thousands of tons. Emissions of toxic carbon monoxide can be decreased up to 25 % by adding 5 to 10 % of ethanol into petrol by scientific analyses [1]. As well emissions of sulfur dioxide can decrease which take part in rise of acid rain, emissions of free radicals in spent gases but also emissions

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of carbon dioxide to which climatic changes on Earth connected with global warming are attributed. Also from this reason was on 8th May 2003 approved by European Union the Directive No. 2003/30/EC which imposes liabilities upon member states to initiate legislation and provide measures to increase share of bio-fuels in the market with propellants.

2. AIMS OF THE SLOVAK REPUBLIC IN THE FIELD OF BIO-FUELS UTILIZATION

Aims of Slovak Republic in the field of bio-fuels utilization in transport are determined in National program of bio-fuels development which was approved by Slovak Republic government in December 2005 and which goes from the Directive 2003/30/EC. Slovak Republic in implementation of this Directive does not belong to flexible countries what is documented by the fact that only from May 2006 is valid government regulation on minimal amount of fuels produced from renewable resources of energy in engine fuel and diesel oil. By this regulation Slovak producers and sellers of fuels should reach in 2010 7,5 % rate of biocomponent in fuels.

Inasmuch as in Slovakia is as a bio-addition into diesel oil used so called FAME (Fad Acid Methyl Ester) and into petrol waterless bio-ethanol, what is basically ethanol (C_2H_5OH), the production of fuel bio-ethanol should be 65.1 tons and 52 thousands tons of methyl-ester of vegetable oil in Slovak Republic in 2010. This assumption comes from present level of consumption of gasoline (c. 700 thousands tons) and diesel oil (c. 800 thousands tons) providing that power fuels consumption will increase about 30% in 2010.

Because production of bio-ethanol in such range is not possible to support in existing capacities, it is needed to extend these capacities and build new modern ones. The question is to what degree will be estimated realizations provided. Seriousness of modifications extending capacities is possible to guess at c. 80 to 100 million Sk and investments to new production in the range of 20 to 30 thousands tons of bio-ethanol per year are guessed at 300 to 500 million Sk.

The real raw materials for bio-ethanol production in Slovak Republic conditions are commodity as maize, white beet and mainly wheat. Following proceeds of bio-ethanol are reached from the mentioned raw materials:

- 336 liters of bio-ethanol from one ton of maize in supposed crop 6 tons it is 2 016 liters of bio-ethanol per 1 ha of maize,
- 302 liters of bio-ethanol from one ton of wheat, with a crop 5 tons it is 1 510 liters of bio-ethanol from 1 ha harvested wheat,
- 83 liters of bio-ethanol from one ton of white beet, in a crop 38 tons of white beet from 1 ha it is possible to gain 3 154 liters of bio-ethanol.

With regard to tradition, equipment and possibilities of basic industry in Slovak Republic conditions there is an assumption that production of bio-ethanol will be provided from 60 % of wheat and 40 % of maize. Added raw materials can be also other grain especially in the case of their market nonproductive overproduction or substandard quality.

It is real to use only colza and sunflower for methyl ester of vegetable oils production. It is assumed yield of 1 ton of oil from three tons of colza and approximately yield 1 ton of FAME from one ton of pure colza-oil at production of methyl ester of colza-oil. Providing increase of colza yield to 2010 from present $2 \text{ t}\cdot\text{ha}^{-1}$ to $3 \text{ t}\cdot\text{ha}^{-1}$, can production of FAME from 1 hectare of soil arise from present 0.67 tons to approximately 1 ton [1].

2.1. Bio-fuels against conventional fuels

The mentioned amount of corn and colza presents floricultural tract c. 125 thousands hectares in 2010, what is c. 15 per cent of corn production per year. Politicians round the table decided that the mentioned amount will not endanger food national security. To what degree is this decision true is nowadays presented by price increase of corn for food purposes and following raise the price of staple foods. Moreover the analyses of costs of bio-ethanol production shows that bio-ethanol from farming materials is not able to compete with the petrol even in higher prices of crude oil than today level is. And also at relatively low realization prices of farming products in Slovakia is reaching of profitability limit for bio-ethanol or ETBE very far.

That is why it is necessary so that the country would waive part of tax on fuels at fuels production from renewable energy resources. Moreover single application of bio-fuels will require direct country participation because in considered horizon (up to 2010) will be bio-fuels probably still about 17 or 18 Sk per 1 kg more expensive than petrol. This problem would be solved by increase of consumer tax on power fuels and decreased consumer tax on renewable fuels. By the state assistance of bio-fuels in the form of tax relief from consumer tax up on high $18\,000 \text{ Sk}\cdot\text{t}^{-1}$ can be revenue of the country at consumer tax on fuels notably decrease while in 2010 can be this decrease present up to 2.7 milliard crowns.

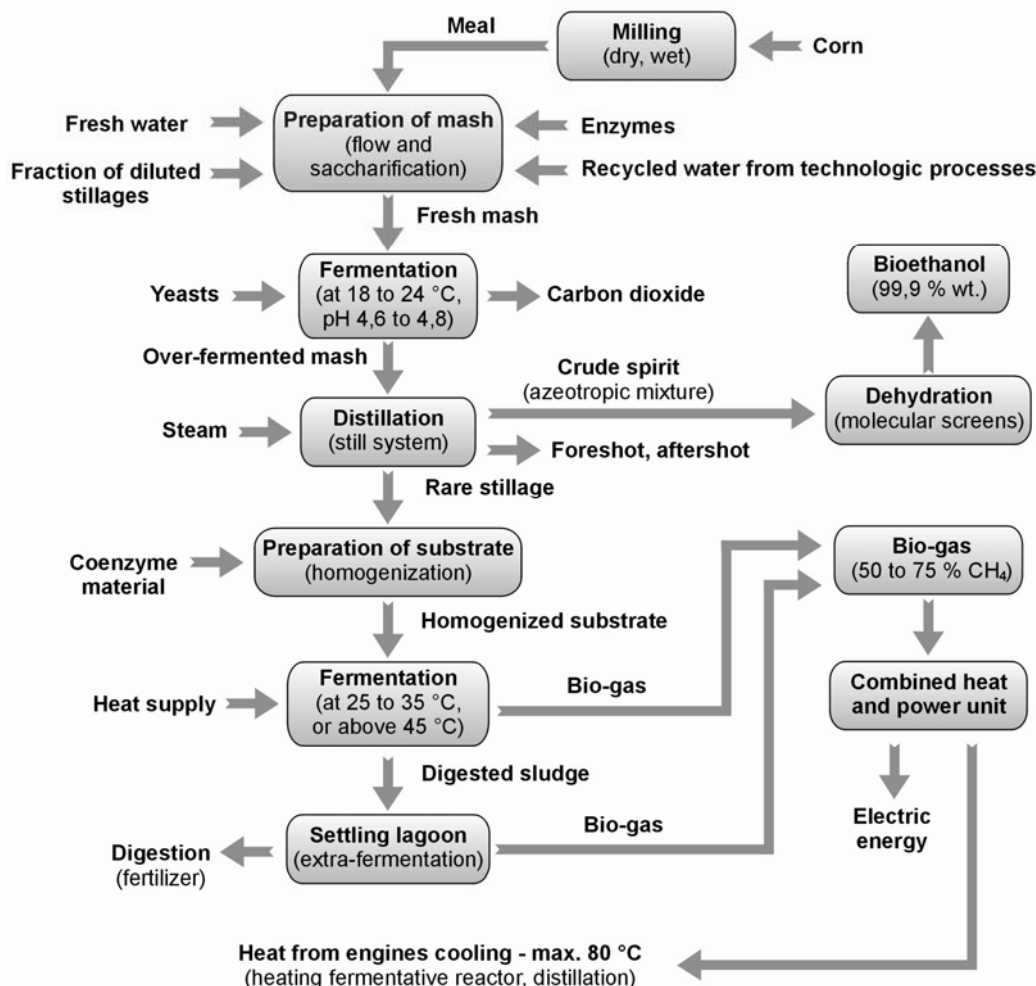
Of course decrease of consumer tax revenue will have to be compensated by other positive influences of substitute of fossil fuels for bio-fuels as increase of direct employment in agricultural basic industry, stable sales of corn and colza, decrease in import of protein fodder extracts and possibility of export of feed in value, saving of social benefits, tax incomes from employed people, and so on, all up to 2010.

2.2. Waste products in bio-ethanol production

Bio-ethanol production is connected with waste production as carbon dioxide (CO_2), rising at fermentation and stillage presenting the rest after steam stripping of ethanol from beer still. Carbon dioxide released while fermentation from bio-mass is considered a zero respectively neutral but if it is retained yet in fermentation there is not reason to emit it into atmosphere and so increase its concentration in the air.

To 1 m^3 of spirit falls on about 10 to 14 m^3 rare stillage with dry matter content on level 5 to 8 % weight with low pH [6]. The statement that a dry corn stillage is excellent feed with high content of protein is well founded but with regard to quotas from EU restricting meat production in Slovakia there will be nothing to be fed by this protein feed. At government level it is supposed that feed surplus gained by drying from stillage will be possible to export but with the export is connected increase of transport and we are at the beginning of the problem - great rate of transport on power fuel combustion and following loading of

environment by exhaust. It is strange to export the feed and to import the meat and strange is also European Union approach to this problem. Moreover drying stillage as well as other processes incident bio-ethanol production (for example multistage distillation) are connected with high energy intensity.



Zdroj: Autor

Fig.1 - Scheme of possible cooperation of distillery and bio-gas station

There is possibility of other utilization of distillation stillage in bio-gas stations which are able to process any biologically decomposable waste. Regarding quotas of EU concerning meat production, there is continuous decrease and restrain of stock raising. This has of course influence on materials availability suitable for wet fermentation in bio-gas stations. From this view rare stillage seems to be a suitable product for wet anaerobic fermentation.

On the other hand waste heat gained from cooling of internal combustion engine of combined heat and power unit could be utilized in bio-ethanol station for example in distillation. Even in the case that refining systems are utilized which come directly from a mash, for 1 liter of ethanol is 1,5 to 2 kg steam with pressure 0,9 MPa used [6]. By reason of high energy intensity it is important to use steam always from previous column with simultaneous reduction of pressure in other column.

On the basis of these processes (pressure lowering) there is a possibility to use, in low-pressure distillation, cooling liquid from engine cooling of combined heat and power energy, even though its temperature is only max. 80°C. The scheme of possible utilization of distillation stillage in bio-gas station and following utilization of waste heat from bio-gas combustion in cogeneration unit in distillation of beer steam is shown in the *fig. 1*.

3. CONCLUSION

Production of renewable components of power fuels should, besides of substitution of part of fossil fuels and improvement of ecologic balance of greenhouse gasses and emissions, mainly solve problems of agricultural production and social situation of the country. Increased rate of bio-fuels in the market with fossil fuels should, by politicians, contribute also to decreasing of energy intensity, but as mentioned above mainly bio-ethanol production is connected with high energy intensity which is given by distillation, cooling and cleaning of crude spirit. Moreover bio-ethanol is characterized by markedly lower energy content against petrol. Also from this reason bio-fuels can scarcely compete with commonly used fossil fuels.

Even bio-fuels can reduce gaseous emission from transport, emissions of solid polluting substances (PM₁₀, PM_{2,5}) will not influence markedly, because they are getting into the air mainly from tyres abrasion on road surface, from brake plates abrasion and from dust particles swirling occurred on the road surface by passing cars [4], [5], [7]. Other problem of bio-fuels production can be growing source raw materials (colza, corn) what requires use of large quantity of fertilizers. This is connected with energy intensity because for production of fertilizers in agricultural sector used about 31 per cent of energy. Moreover using fertilizers can have rather bad effects to environment. From this point of view it is necessary to carefully consider to what extent can be bio-fuels the real energy saving in transport and to what extent they can contribute to reduction of noxious agents in the atmosphere. And whether there would not be steps realized for reduction of traffic volume.

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