

MobileBioGas: Mobile filling station of cleaned and compressed biogas

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Problem identification

Production the electricity from biogas is a well known solution. Nevertheless, one of the main disadvantage of this technology is the low efficiency of the energy use, in case where the heat from biogas combustion is not fully consumed. Biogas is produced mainly in waste treatment systems or in agricultural biogas plants, which are usually located outside the urbanized zones. The highest efficiency of the biogas utilization is performed when the heat and electricity is consumed by nearby located industrial companies. However, location of the biogas plants outside the urbanized zones limits the ability to use the biogas efficiently.

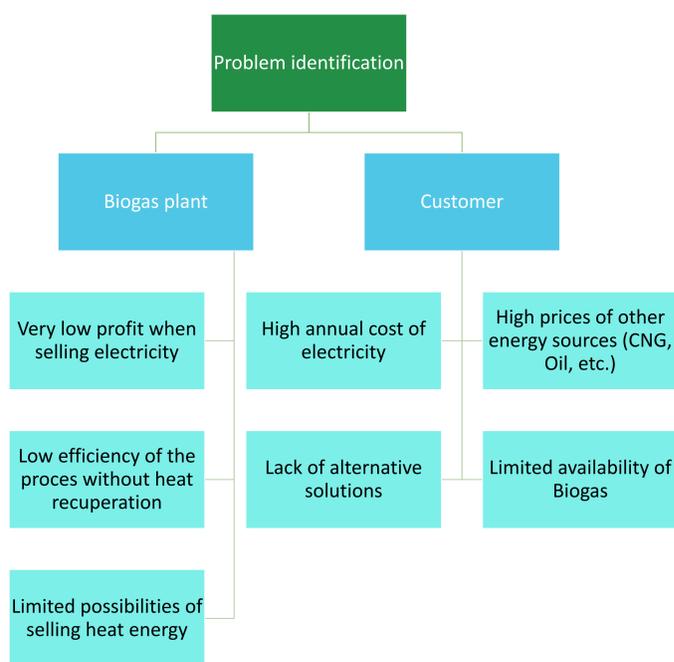
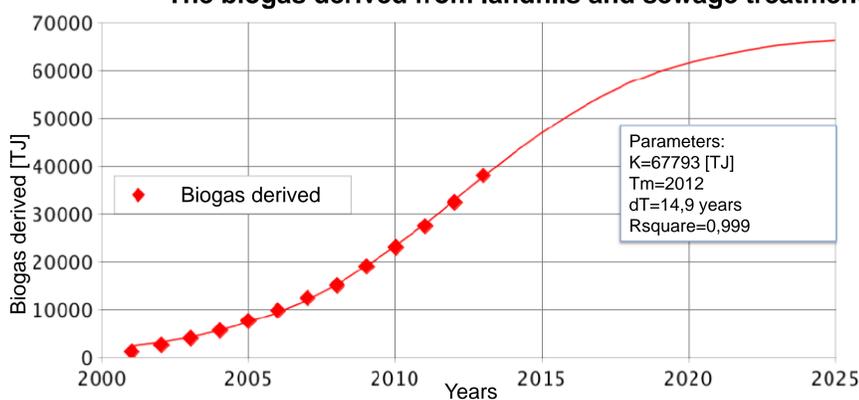


Fig. 1. Problem identification from the point of view of the Biogas plant and the customer

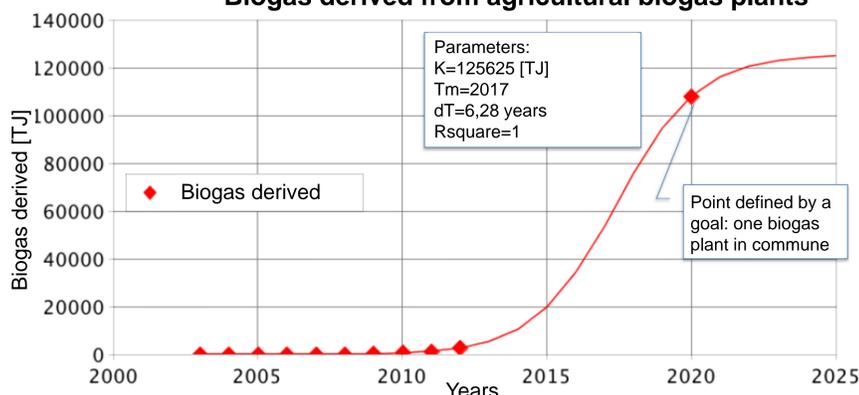
As a part of the problem identification, the forecast of the Biogas market in Poland was held at the Wroclaw University of Technology. Based on the statistical data and using the FORMAT methodology, the forecast was formulated.

The biogas derived from landfills and sewage treatment



[1] Renewable sources energy in 2012, Central Statistical Office of Poland, Warsaw 2013 (in Polish)
[2] Renewable sources energy in 2006, Central Statistical Office of Poland, Warsaw 2007 (in Polish)

Biogas derived from agricultural biogas plants



[1] Renewable sources energy in 2012, Central Statistical Office of Poland, Warsaw 2013 (in Polish)
[2] Innovative Energetics- Energetical Agriculture, Program of Polish Ministry of Economy (in Polish)

Proposed solution

The presented solution is the MobileBioGas Station which allows to make the biogas available for every industrial company with the high need of electrical and thermal energy consumption. The essential problem, which has been undertaken to resolve is purification, storage and distribution of biogas in a safe and economically justified way. For the purpose of this project, the theoretical model of transport of Biogas was built and the basic parameters of transport were established. The most crucial one is the Energy content in transport of Biogas, shown on fig. 4.

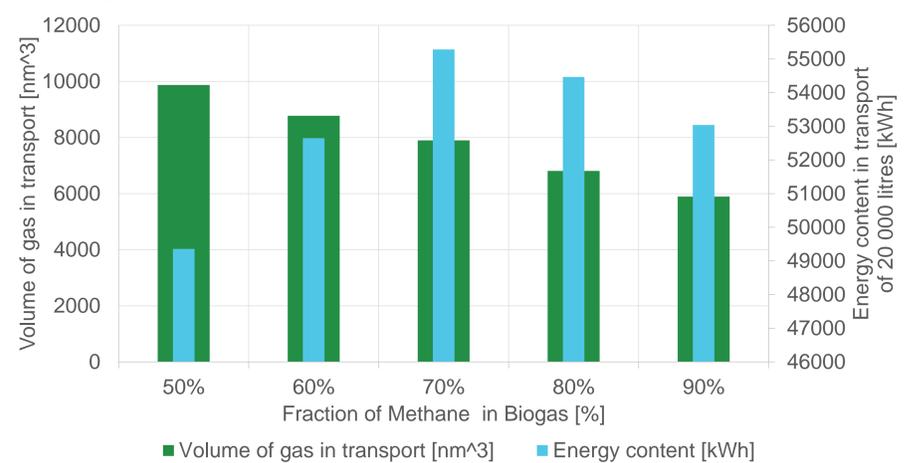


Fig. 4. Graph showing the volume of Biogas in transport and energy content of transport for assumed transport size

Conclusions

The MobileBioGas station will be capable of transport of Biogas that will fit the needs of the customer. The modular structure of station allows to adapt its size to the customers needs and to provide the most effective supply of energy. Additionally, the business model of MobileBioGas station is presented.

The big significance in the use of MobileBioGas is the low price of the Biogas because of its preparation- it does not have to be purified from carbon dioxide, reducing the cost of obtaining of the Biogas. This results in much lower price of the gas.

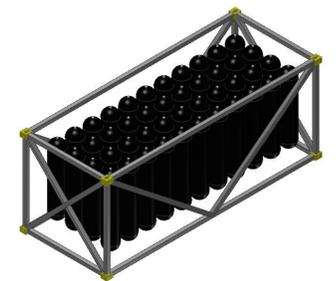


Fig. 5. Concept model of a Mobile Biogas Station

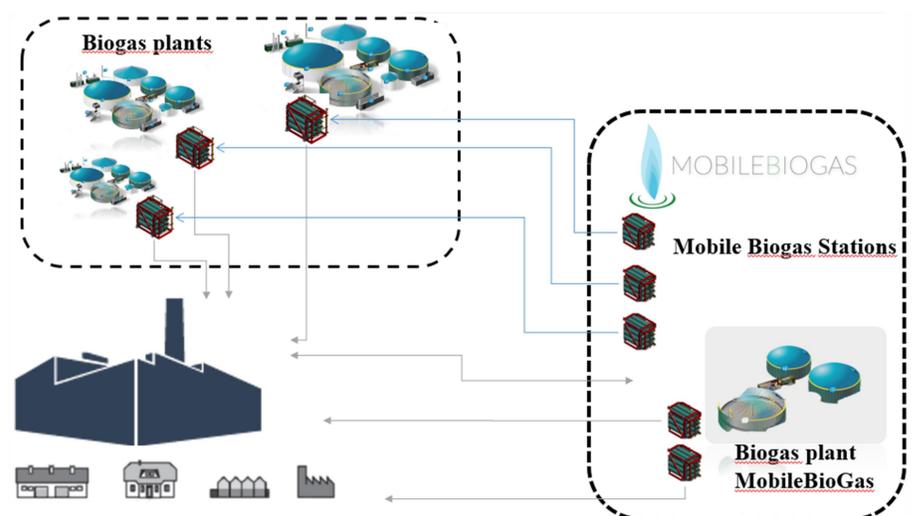


Fig. 6. Business model of MobileBioGas Station.

Figures:

„The biogas derived from landfills and sewage treatment” and
„Biogas derived from agricultural biogas plants”

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Forecasting of vehicle development in 2030

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Problem identification

One of the key problems in business development is the prediction of future needs of consumers. Knowing this allows continuous improvement of companies through realization of strategy based on knowledge. Nowadays, many companies base their strategy on intuition, with less effort on taking into consideration the future needs of customers and fulfilling them. In this work, authors present the forecast of vehicle for everyday use development. Current development analysis were concentrated mostly on global trends in supplies, materials and technology that affect directly the evolution of cars. The proposed approach is to take into account changes in economy and technology, as well as social and environmental evolution. Additionally, the work presents examined relations between those variables and the way they influence the development of cars.

Method

Methodology presented in work is characterized by new approach to the forecasting problem mostly due to the fact, that it does not concentrate only on effects of development as most of other known methods do, but it takes into account changes in market's needs, limits and problems. Additionally, the presented method allows to analyze problems globally, their roots and limits with relation to effects today and in the future. Adopting this systematic approach it is possible to assess the present stage of development of cars in an objective way. Subsequent steps of forecast are presented below:

Table 1. System operator in forecasting of vehicle development

Supersystem: <u>Transportation system (alternative technologies)</u>			
	Past: 2000	Present: 2015	Future: 2030
System: <u>A vehicle for everyday use</u>	<ul style="list-style-type: none"> ✓ Less people travelling by car ✓ Less cars on the roads ✓ Higher fuel consumption ✓ Higher car density on the roads ✓ Higher GHG emission 	<ul style="list-style-type: none"> ✓ More people travelling by car ✓ More cars on the roads ✓ Lower fuel consumption ✓ Lower car density on the roads ✓ Lower GHG emission 	<ul style="list-style-type: none"> ✓ More people travelling by cars ✓ Much more cars on the roads ✓ Much higher fuel consumption ✓ Slightly lower car density on the roads ✓ Slightly lower GHG emission
Subsystem: <u>expenses (TIMES: crude steel production, oil production, time of travel)</u>			

Step 1. FORmulate



Fig. 1. Essential question formulated at the beginning of forecasting process

Step 2. Model

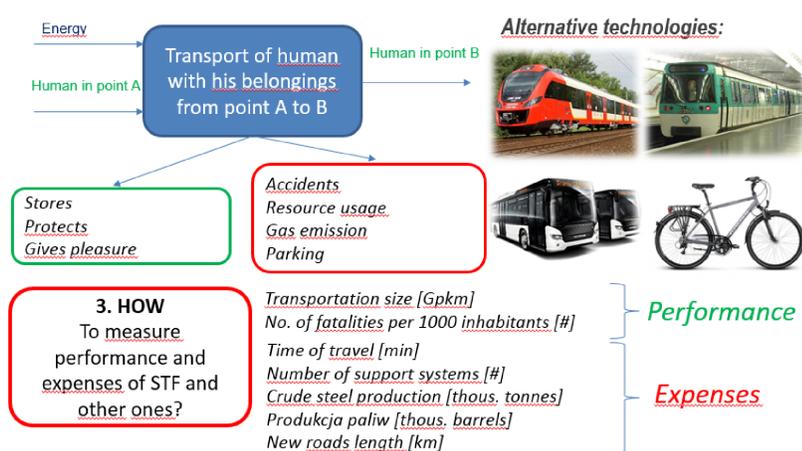


Fig. 2. Functional model of vehicle for everyday use and alternative technologies

Step 3. Act Parameter evolution

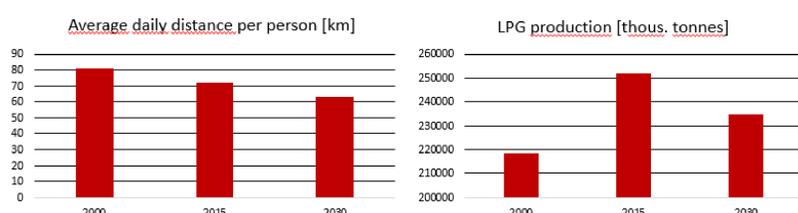


Fig. 3. Evolution of parameters based on S-curves (only example of two graphs)

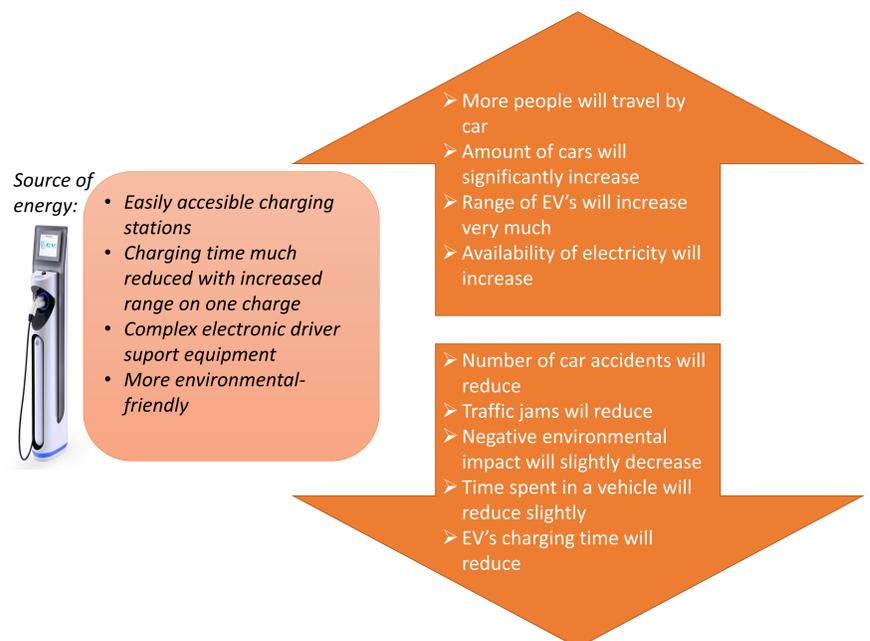


Fig. 4. Description of the vehicle for everyday use in future

Conclusions

The presented forecast allows to determine key problems that will appear in the future in automotive industry. Limits that were extracted in this research were referred to the present state of development in R&D departments in automotive. The conducted research shows, that the most significant change in this sector is the change of petrol/diesel engine into electric motor. This is the direction of development that should be taken in order to satisfy the needs of consumers in the future. As for today, electric cars do not fulfill the requirements that it has to face in the future- the limitations as concerns low range and long charging time have to be solved. Application of FORMAT methodology is possible in every branch of the industry and service. Preparation of deep forecast allows to assess the direction of development in a just way and to develop the technology that will solve real problems in the future.