Propane and butane gases, distribution of the LPG gases, preventing sea pollution, gas carriers, logistic distribution of LPG, logistic centre, gas distribution in off-shore of Venezuela

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LOGISTIC CONCEPTION OF THE DISTRIBUTION OF LPG GAS IN THE OFF-SHORE AREA OF VENEZUELA

The basic concept connected with distribution of propane and butane gas and the situation in the world in the scope of distribution of these gases have been presented and discussed in the introduction. It makes the authors ponder the logistic planning of operations of the distribution of LPG gas. Authors concentrated on the topic of the distribution of gas because one of them participated in preparation of the conception construction Gazoport in the port Gdańsk, and the other gained experience sailing on the ship for the transport of liquefied LPG gas in the inshore area of Venezuela. In the further part of the paper detailed suggestion of solving the above mentioned problems, taking into consideration such factors as safety, environment protection, costs and the time of fulfillment of orders. The outline of distribution presented in the paper would allow a considerable reduction of costs connected with distributing LPG gas.

LOGISTYCZNA KONCEPCJA DYSTRYBUCJI GAZU LPG W REJONIE PRZYBRZEŻNYM WENEZUELI

Artykuł omawia podstawowe zagadnienia związane z dystrybucją gazu propan i butan oraz sytuację panującą na świecie w zakresie dystrybucji tych gazów. Przedstawiono kwestię budowy Gazoportu w Polsce.

Przewóz ładunków drogą morską jest niezwykle szybko rozwijającą się gałęzią transportu, co zmusza do logistycznego zaplanowania operacji dystrybucji gazu LPG. Autorzy skupili się na temacie dystrybucji gazu, gdyż jeden z nich uczestniczył w przygotowaniu koncepcji budowy gazoportu w porcie Gdańsk, a drugi nabył doświadczenia pływając na statku do przewozu gazu skroplonego LPG w rejonie przybrzeżnym Wenezueli. W referacie zaproponowano możliwości rozwiązania powyższych problemów z uwzględnieniem takich czynników jak bezpieczeństwo, ochrona środowiska, redukcja kosztów i czasu realizacji zamówień. Zaprezentowano nowatorski system raportów umożliwiających połączenie poszczególnych ogniw dystrybucji gazu w jeden ciąg logistycznych działań.

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1. INTRODUCTION

Propane and butane gases are the basic raw materials used at many production processes and in households. These gases appear in small amount in natural gas and considerably in petroleum. They are produced in the process of the distillation of petroleum. Gas obtained this way is a mixture of propane and butane and well-known as LPG gas. This mixture or clean propane or butane is delivered to the recipients in relation to the demand. Fast and, as far as, possible cheap distribution of these gases from the refinery to potential recipients is an extremely important matter. Distribution in the offshore area is not only transport of this raw material from the refinery to individual recipients, but also all logistic planning of the operation to minimize costs and time and ensure security during carriage and preventing sea pollutions.

In many countries in the world together with their rapid development there is a need to organize the transport and the distribution of LPG gas in the offshore area. Such transport can take place in the twofold way:

-pipelines,

- sea transport.

Laying pipelines on the seabed is connected with high expenses and the problem of maintenance and the exchange of damaged elements. Owing to that, sea transport is becoming more and more popular and it is rapidly developing. Countries world-wide are interested in construction of terminals for the transshipment of LPG gas in their ports. Poland is a good example of this matter. At the moment country is being supplied with gas through the pipeline running from Russia. Poland decided to build a gas terminal and become independent of gas supplies from Russia. There were disputes regarding the transshipment of gas and finally, Świnoujście is a proposed location of the terminal. This port is situated on the Baltic Sea which is an unquestionable benefit. However, a number of negative aspects of the construction of the terminal exist in this region.

Fig.1. An example of LPG carrier. Reference [10]

A new threat to lands surrounding it will be created by Gazoport. A site close to Naftoport in Gdańsk would be better for it. The construction of the terminal in Świnoujście is an expensive investment because this area is not prepared for accepting big gas carriers. Undoubtedly, Gazoport would have a negative influence on the environment. The area surrounding Świnoujście is very attractive for tourism and after the Gazoport building site that will change.

All countries are trying to choose the most beneficial area of handling terminals in order to assure the fastest and cheapest distribution of gas. It is necessary to plan all the actions well in order to benefit the companies participating in distribution.

2. PRESENT SITUATION

Logistic organizing of distribution of LPG gas requires meeting many criteria. The main factors are considering the conception of distribution are time saving, minimizing costs and raising the safety of transport. An analysis will be carried out on the example of Venezuela where LPG distribution is poorly organized. In this paper, the author will use the experience that he acquired during his job contract on the LPG vessel in the offshore area of Venezuela. In the article mentioned below the main focus has been on planning the distribution of propane and butane gas by sea in the offshore sector of Venezuela with regard to dynamics of the development of this form of transport. In order to present the logistic conception of transport the following problems should be analyzed:

- present state,
- estimation of the demand for LPG gas,
- acquiring,
- transport,
- port services,
- coordination of actions,
- environmental protection,
- other factors.

Both authors were involved in the problems connected with gas distribution. As an example they chose distribution of LPG gas in the offshore area of Venezuela.

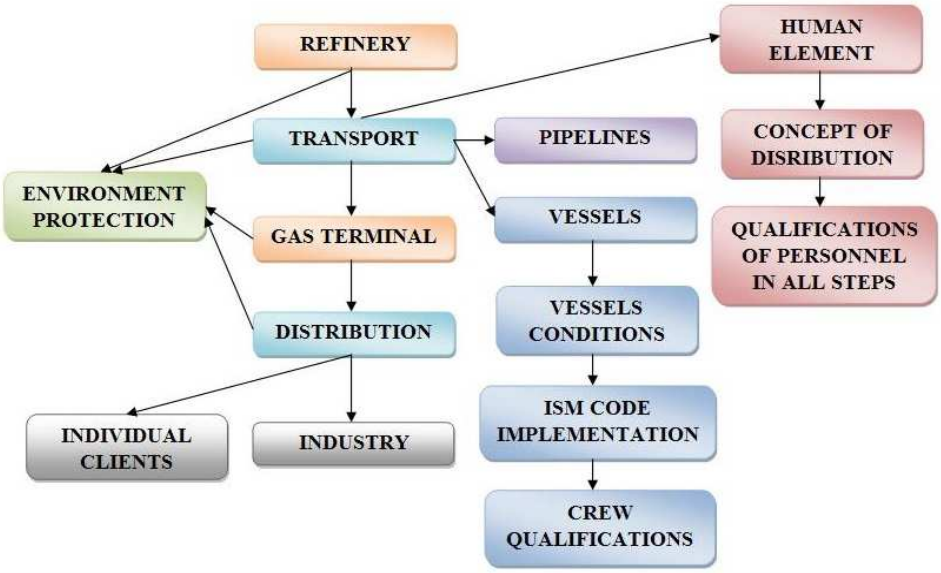

Fig.2.Technical part of gas distribution

The distribution of gas which takes place in Venezuela is practically inside one powerful national company. It is the owner of the only refinery which produces gas, located in Puerto Jose. The national company is also the owner of most factories in Venezuela and points of local distribution to which transport of gas is provided. The same company is also the party chartering ships which are used for the transport of LPG gas. Creating the centre in an area of the country with qualified staff who would supervise distribution should be in the interest of the company. At present, the repeatedly appearing lack of information about the reserves of gas in the refinery causes that a ship cannot load the amount of gas determined earlier, because the storage tanks are empty. It should be quoted here: after getting information for a given sea voyage called voyage orders, the chief officer prepares the ship for accepting a given type of cargo and its amount. In the loading port, the officer supervising this process during the loading operation notices that it will not run smoothly, namely that the gas is not flowing into a ship's tanks. After making an inquiry in the

terminal, he learns that there will not be more cargo because there is a lack of supplies in the refinery. It simply shows the lack of the flow of information essential to minimize the costs of transport. Such a situation causes a considerable rise in the costs of the distribution of gas. The next important element which undoubtedly exposes the charterer of the ship to considerable costs is a precise organization of port services. It means the operation of tugboats and engaging pilots. A ship which lies at anchor gets information from the terminal so that she may sail to the pilot station as soon as possible in order to enter a port. After arriving at that place, it turns out that either it is necessary to wait for the pilot over an hour or there are no available tugboats for mooring operations. It sometimes happens that the terminal personnel declare that the time of expectation will be more than 2 hours, and then the captain decides to sail to an anchorage. After dropping anchor again, it happened that the terminal personnel suddenly changed their mind and ordered the ship to return to the position of the pilot. A question arises concerning the organization of these services. Assuming that the tugboats are about 2 hours away from the port, and the passage of the ship from the pilot station to the anchorage amounts to about 20 minutes, what a miracle it was that tugboats sailed such a long way in such a short time for which they needed 2 hours at first. A complete lack of synchronization of port services and the terminal can be seen. At first, the captain gets information from the terminal to proceed for the pilot station and the next step is employing the pilot and tugboats by the terminal. The order here should be different in the opinion of the authors of the following paper. It should be noted that large amounts of fuel which could be saved needed for every starting of the engine of the ship cause additional costs. Declaring the cargo for transport by the charterer is the next important aspect which must be considered. A ship sails for cargo but her captain does not know till the last moment what type of gas will be loaded. Propane or butane can be such gases which are connected with different preparation of the cargo tanks. The temperature of the transport of propane is much lower than that of butane, and consequently the tanks must be appropriately cooled before the loading of this gas. According to the rules, the chief officer prepared tanks by cooling them to the right temperature appropriately. After a few hours which past from carrying this operation out, we received information about a new type of cargo which was butane. It was necessary to heat all the tanks. Such unconsidered actions expose the charterer of the ship to extra costs. It also proves the lack of the flow of information on what the factory or what station of distribution of gas needs what amount and what type of cargo in a given moment. This information is very important and will help to reduce the costs of the use of ships and to streamline and quicken the transport of this cargo by sea. The captains of ships supplying gas in this region not only learn at the last moment what cargo they will transport but their ships are also lying at anchor even a week waiting for loading. Such a situation could be avoided if a better organization was designed. A ship could avoid anchorage and sail directly to the port of Curacao which is on the way of loading and unloading ports, in order to replenish the ship's supplies. It is also possible to make essential repairs or overhauls during the time the ship lies at anchor. The heart of the matter is that nobody knows until the end when the ship is supposed to sail into a port and start loading. Reports sent by the ship and by the refinery should be the next important matter to the company where it is possible to plan all steps of supplies. Such reports from the ship are sent twice a day at 6 am and at 3 pm local time. They contain data concerning the speed of the ship, the estimated time of arrival at a given port and in the case of discharging or loading, the estimated time of completion these tasks. These reports are

required by the company but it reserves only the data which must be included in the report. However, way of information is not given, which would facilitate the work and coordination of operations. At the moment, the captains of ships are sending the same information, but in a different form of information. The specific way into which one should enter appropriate data and send to owner is missing. The above mentioned mistakes are not everything which appears in the local system of the distribution of gas. The next very important problem concerns the services provided by agents. There are quite a lot of companies in Venezuela and each time, even at the same port different agents are employed. It results in heavy flow of ships in this region. However, it is not a fundamental problem. Owner operating in the region of Venezuela does not deliver information until the last moment about the agent in this voyage. The captain of the ship learns about it from the voyage orders. However, it often happened that such a voyage order was changed so it meant that the agent would change, too. Different types of peculiar situations also took place. After contacting with the expected agent for the voyage, it turned out that he had received no guidelines from the company as far as the operation of the ship was concerned. After the next contact with them it turned out that a different company had been an agent. Such situations make the information exchange between ship and charterer extremely complicated and also delay the ship's operations. The system of selecting the agent operating a ship in port should be developed which would foresee the operations carried out by a ship. It also happens that agents do not know exactly when a ship finishes discharging or loading and they cannot deliver appropriate transit documents to the ship on time. Due to that, ship must leave the port and she is directed to an anchorage in order to wait for the necessary missing documents for continuing the sea voyage in the waters of Venezuela. It generates extra costs of the ship as well as the fee for the supply of these documents to the ship lying at anchor. They constitute unnecessary costs, which the charterer must bear because of bad organization of services and lack of the flow of information between the terminal and the agent. The way of communication is still a more considerable problem between a ship and some terminals. As an example, it is possible here to present the terminal of El Guamache, whose personnel are not familiar with the knowledge of English. For the purpose of communication with the terminal, the author of the paper used deck cadets from Venezuela as interpreters. If it were not for the cadets, communication would simply be impossible because the personnel didn't know even basic words in English. The problems presented above make one think how to improve and create a new system of the distribution of propane and butane gas in Venezuela.

3. PLANNING AND CALCULATING DISTRIBUTION OF LPG GAS

The system of reports which would be sent to logistic centre should be created. Such reports would come from all the workshops where LPG gas was provided and they would contain the information concerning the specified demand of gas. Such a model report is shown on Fig. 2.

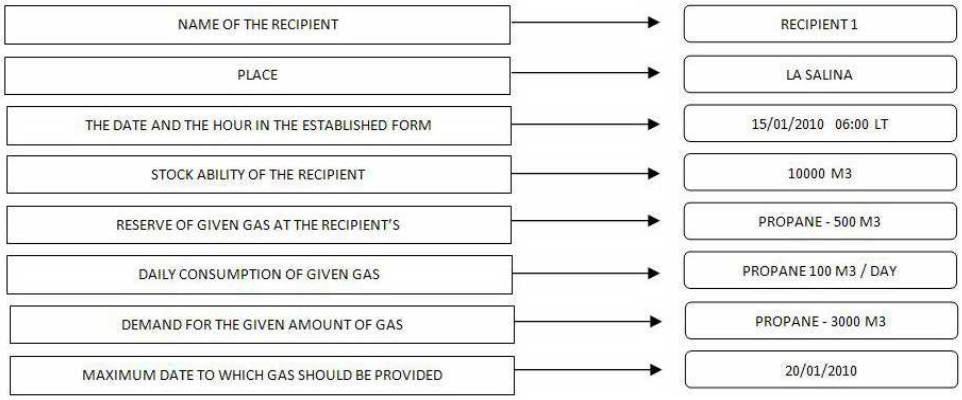

Fig.3. An example of report prepared by the recipient for the logistic centre

This information will let the personnel of the centre establish what ship is closest to the refinery and organize the delivery in such a way as not to exceede the date set by the recipient. It would allow the recipient to avoid delays of gas in the production process or further distribution. Such a solution will also allow for planning later trans-shipments because it will be possible to predict how much gas and when the recipient will need which will contribute to streamlining the distribution of raw material.

The next stage of creating a new system of distribution is compiling reports sent by the refinery producing propane and butane gases. The information included in them will be passed on to operators of the logistic centre and they will know how much gas at the moment they have assigned for distribution in the refinery which produces it. The report of the refinery producing them could look as follows.

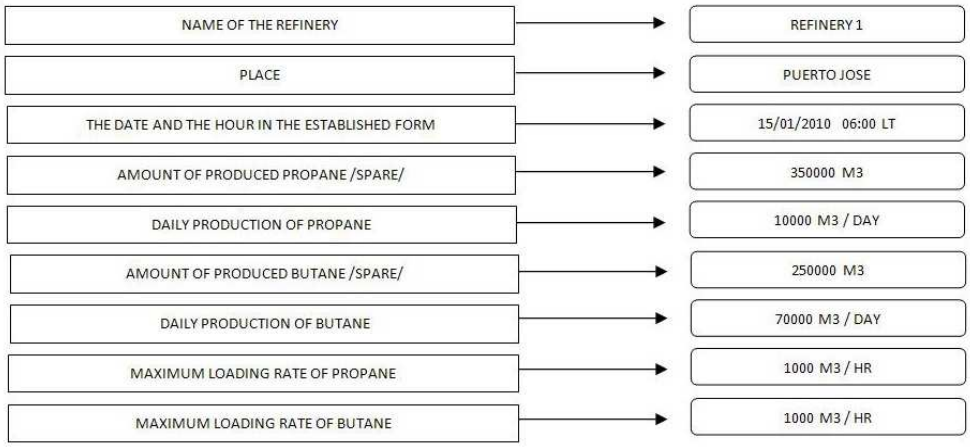

Fig.4. An example of report prepared by the refinery for the logistic centre

Thanks to such a specific report, the personnel of the logistic centre will be informed what kinds of cargoes they administer and in what amount. They will also obtain from ships information on the maximum loading and discharging rates for ships. Due to the data concerning the rates the expected time of completion of the ship in the terminal can be calculated. They can also send the ship for fuel or supplies if the amount of cargo is insufficient for loading the ship. This way she does not unnecessary wait for the cargo, but will approach the terminal in the time planned, which can be roughly estimated on the basis of the report.

4. THE TRANSPORT OF LPG GAS AND PORT SERVICES

The transport of LPG gas by sea is a very important element of the distribution process. A uniform system of handing information from ships should also be implemented here. Reports could be sent twice a day and a ready specimen of the form should be available. Such a form should contain data which are essential for further management of the marketing process. An example of such a form is presented below.

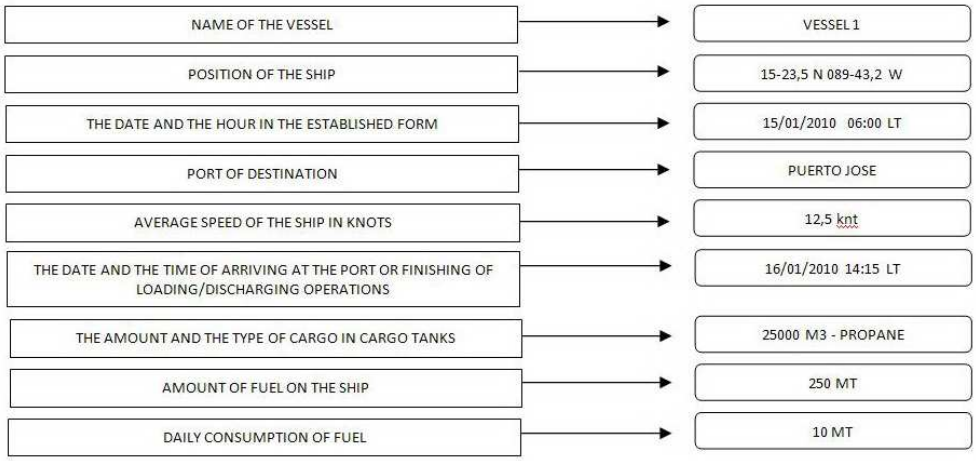

Fig.5. An example of report prepared by the vessel for the logistic centre

Thanks to standardizing of the sent information from the ship its automatic receipt will be possible through a computer system and the automatic revision of the database concerning the transport of gas. This information will allow a better plan of the traffic of ships. Due to that, operators in the logistic centre will be informed how many days the voyage lasted, where the ship is at the moment and how to plan the loading considering reserves running out of fuel.

When a ship is approaching a port, she should always have all port services assured. The services of tugboats are meant here. The majority of these ships is also the property of the distributing company. The report system should also be implemented on these ships. The outline of transmitted data could look as follows.

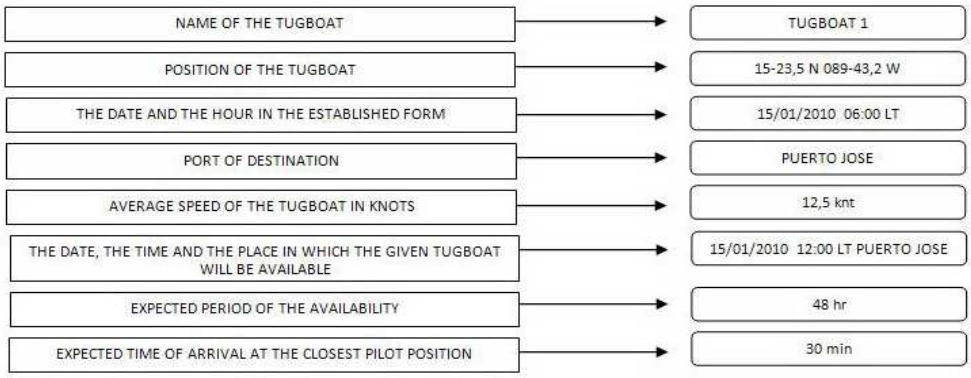

Fig.6. An example of report prepared by the tugboat for the logistic centre

Such a solution will make it possible for operators in the logistic centre to know the positions of tugboats and the moment, in which the tug is available. Then this information will be passed on to the agent, in order to the reserve their time for port operation. Operators could inform the ship of the expected time of stay on the anchorage expecting tugboats. Such files should be sent to the server which would be installed in the logistic centre. Ships and tugboats are monitored by the personnel in the logistic centre which is essential to inbound and outbound ships. Such a solution would make it possible to manage the entries of ships to terminals quickly and efficiently.

5. THE COORDINATION OF ACTIONS

The last stage of the new system of LPG gas distribution should be created at the logistic centre, where all the reports mentioned by authors are received. In this centre a group of people would manage the distribution of gas on the basis of the information from the report system which would give access to the following information:

- amounts of produced gas,
- demand for this raw material in different parts of the country,
- availability of the delivery fleet and essential port services (pilots, tugboats).

It is very important to coordinate each of these processes in one place and send orders from one place. An example of such a logistic organization is presented in outline of distribution mentioned below.

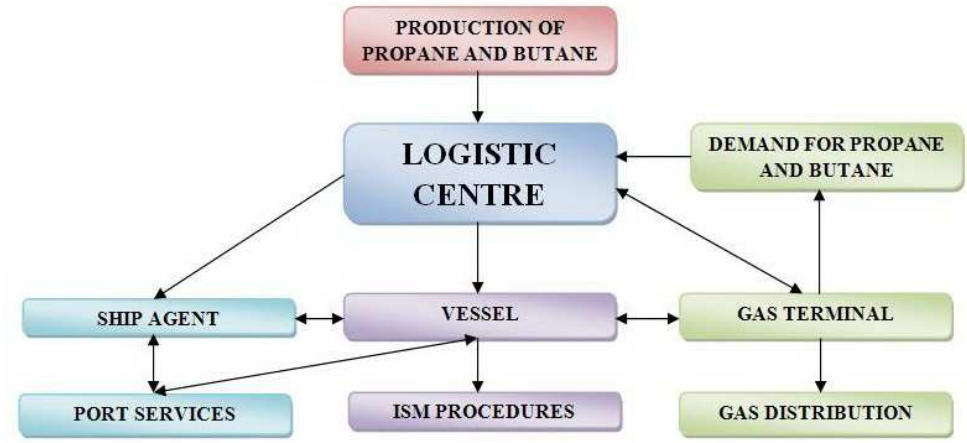

Fig.7. Scheme describing distribution of gas

In the centre the following decisions could be taken, i.e. what ship should be sent and where, who is an agent how much and what cargo is the ship supposed to transport. It would also deal with making the information available to agents in relation to the availability of pilot and tug services. It should create appropriate form reports which would be sent to the central server. Next, special software will automatically update data in the main base. Such improvement of fully planned distribution of gas will be possible in the inshore area of Venezuela, where the same body is both a producing company and recipients. Such a system will cause the marketing process to become more efficient. It will also allow considerable reduction of costs connected with distribution as well as spare the nerves both of port workers and jetty men and sailors. An unabridged scheme is introduced below presenting the transfer of information between individual parts which take an active part in the distribution of gas.

In the Fig. 8, the logistic centre carries out the data analysis and then works out specific passage plans for ships after gathering information coming in from different sources. After working out such a plan, the information from the centre is sent to the refinery so that it prepares for taking in the ship at a given time. One by one a recipient is informed of when the cargo will be delivered. A ship is also informed of what port she is to be bound for, when her loading days are fixed, how much and what cargo will be loaded, who is its agent in a given port, as well as what its unloading port is. Sending the following information to the agent is a consecutive step:

- kinds of documents which the agent must organize for the ship,
- which supplies and their amount are needed for the ship,
- what kind of cargo the ship will transport and its amount,
- availability of tugboats at a given port.

The agent, having this information, makes contact with a ship for the purpose of establishing a range of services which the agent is supposed to provide. After such a procedure the agent organizes services for the ship. One of the most important matters is

engaging the pilot and setting the date and hours of providing services for the ship. Next, the agent reservs the service of tugboats adjusting them to prior agreements made with the pilot.

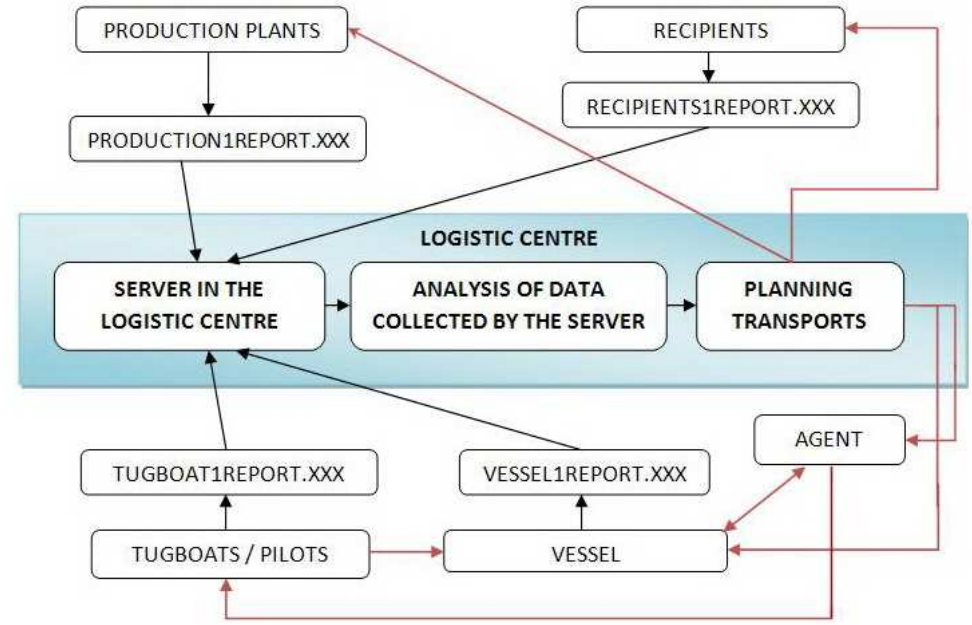

Fig.8. Scheme presenting the flow of information between individuals taking part in the distribution process of gas

6. ENVIRONMENTAL PROTECTION

Care for environmental protection should be an inherent element of every distribution. For this purpose, it would be useful to create the individual section by the logistic centre. It would deal with the spread of information on the state of the environment in the inshore area of Venezuela on ships and would constitute the critical centre at the time when some ships transporting LPG gas were damaged. ISM Code should be implemented containing check lists.

7. OTHER FACTORS

As it was told, we cannot forget about people in the distribution process. They are the most important link in logistic distribution of LPG gas. It should raise earnings of such personnel as well as provide them with the sequence of vocational training courses and a course in the English language. Due to that every worker would be appropriately prepared for performing his function and the language barrier would be eliminated between crews of ships and workers of handling terminals. An important matter is providing these people with proper facilities. Places of employment should be equipped with proper machinery in

terms of the industrial safety. An internal system of communication should be introduced. Communication between workers would be improved by these systems which would give a better quality of their works.

8. CONCLUSIONS

As the paper showed, the system of the distribution of LPG gas should insure the following functions:

- environmental protection during acquiring, transport and distribution of LPG gas,
- ergonomical way should fulfill propane and butane production according to demand of LPG gas,
- use of vessels for transport of LPG Gas (always the same fleet employed) in economical way,
- employment of highly qualified perrsonnel,
- calculation of minimal costs for all process started from production and finished at distribution.

Available computer systems allowed connecting all information in one place. In this way, it allowed to build the centre, which would be coordination production, demand and final distribution of LPG gas.

This paper shows fast and efficient organization of transport services by sea dealing with propane and butane gas off Venezuela. It is a simple system, which is needed for the organization of certain financial contribution. However, economic and temporal benefits are nothing compared with the costs incurred. Due to such a system the distribution of gas in the inshore area of Venezuela will be fast, cheap and will not generate unnecessary costs. It is hoped that the distributing company will consider streamlining this distribution because at the present moment it bears high costs because of the lack of synchronization and the incompetence of the people employed. Let us hope that the system of distribution of gas in this region will take place by sea modified this way so that transport of cargoes is carried out fast. At present ships lie at anchor not knowing the exact date and having no brochures concerning the next cargo. It is hoped that the LPG gas distributor will undergo and it will streamline this system in the near future.

Above mentioned remarks regarding efficiency of functionality of LPG terminals in Venezuela and defined basic on this users experiences should be taken in consideration in the planning logistic operation in the newly build polish gas terminal in Świnoujscie.

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