The experiment for another microchip has shown that safety stock has been used during the lead time because of unpredictably high demand – having average monthly demand of 9800 pcs, that month demand is 17789 pcs. This demand will be taken into account in further safety stock calculations. Company's average inventory level based on real data is 6964 pcs, average inventory level of the proposed inventory management system is 5955 pcs.

VI. Experiment 2

An improvement of company's inventory management situation is twofold: inventory management process application and agent system realisation [3], [4]. Agent system can provide the following benefits to the proposed system:

- It can learn from the past inventory, forecasting and replenishment histories;
- It can change demand forecasting techniques, inventory control constants and replenishment policies if needed;
- It can ensure monitoring and control of large amount of SKUs;
- It can provide autonomy and pro-activeness.

This paper presents part of the ongoing research on *AEMAS* (Assembling Enterprise Multi-Agent System); therefore, it is related to the inventory management agent [3], [4]. One of the functions of inventory management agent is to make decisions on when and how many microchips to assemble. It has the information of the possible minimum reserves – safety stock, the future demand forecasting algorithm and the production capacity. Inventory management agent has the following behaviours: ABC classification algorithm, future demand forecasting algorithms and replenishment policies in order to avoid out-of-stock situations, meanwhile decreasing the inventory levels and their holding costs.

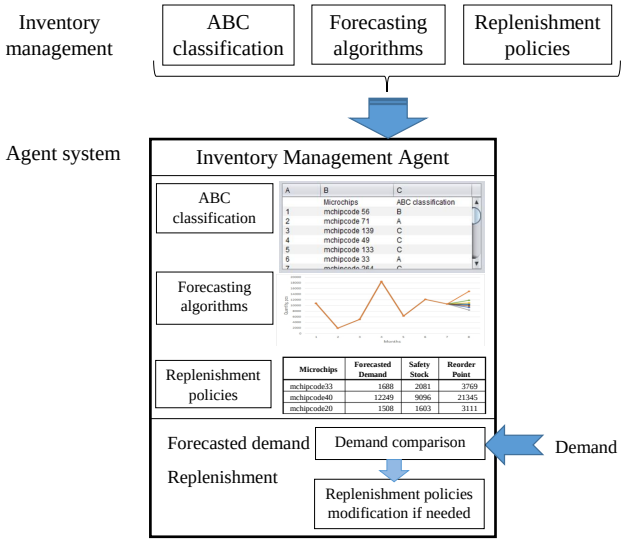

Fig. 7. The idea of agent system application for inventory management.

Excel file is provided as input data for agent system's ABC classification algorithm, then the forecasting methods are applied to microchips and forecasting errors are calculated, according to achieved results the best forecasting method is chosen for every microchip that is intended to be used subsequently. Replenishment algorithm uses forecasting results, calculates safety stock and reorder points. Meeting real demand, the agent-based inventory management system compares it with the forecasted demand and makes modifications in future orders to assemble if needed. This inventory management system can be fully automated or work as a decision support system for an inventory manager [3]. The output of a fully automated system is an agent decision, alternatively, if the system works as a decision support system, then a manager decides whether to agree or not with the proposed system recommendations.

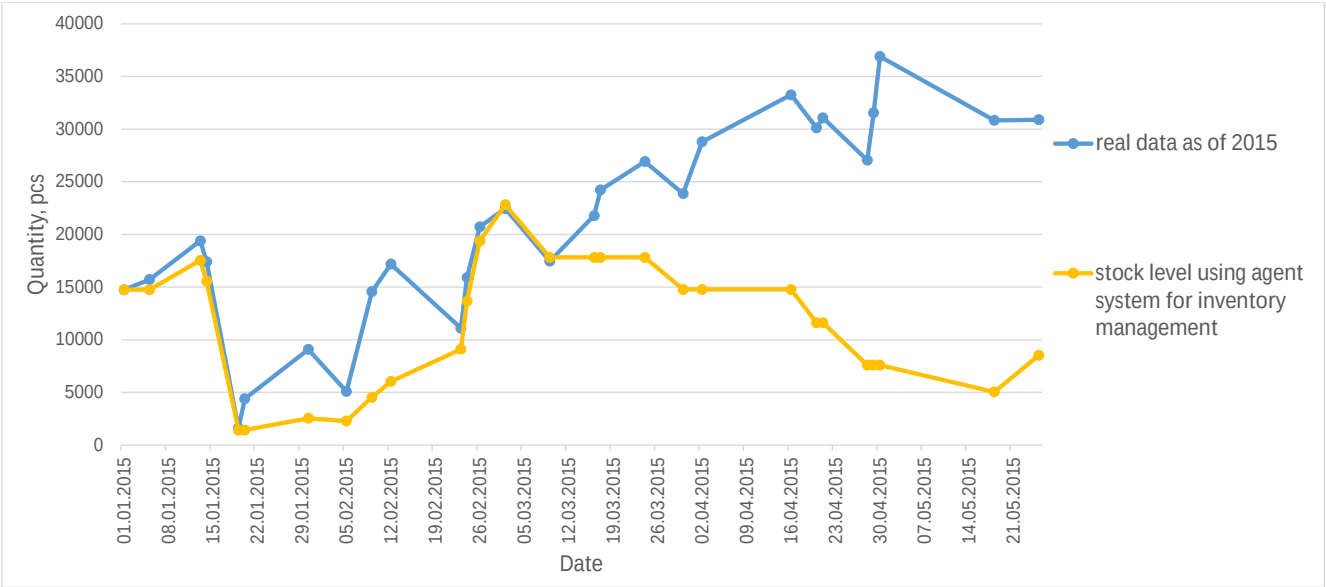

Fig. 8. Comparison of the inventory management agent system with real data.

The idea of the second experiment is that meeting the real demand it is possible to change replenishment policies (Fig. 7). Again, the comparison of inventory levels' quantities is presented (Fig. 8).

The experiment has shown the following results: for the first type of microchips the inventory level has decreased compared with company's real inventory level. Company's average inventory level is 20860 pcs; the average inventory level proposed by the agent system is 11461 pcs.

Another microchip type has the following results: company's average inventory level is 6964 pcs; the average inventory level proposed by the agent system is 5405 pcs.

At the end of May 2015, inventory levels had the following results: the lowest inventory level was typical of the agent-based inventory management system (due to timely reaction to demand comparison), the highest one was shown by company's data. Agent-based inventory management system showed the best results in comparison with simple inventory management application and real data. The difference between the results provided by the agent system and that of the inventory management (Fig. 6, Fig. 8) was not so considerable, as it was between real data and agent-based inventory management system. This could be explained by the following: at the end of 2014 the demand had an increasing trend, but in February it started to decrease; therefore, the agent system took into account this demand shift.

VII. Conclusion and Future Work

Inventory management is essential to every company, having inventories. Companies need to have stock, but in such amount to avoid out-of-stock and overstock situations.

Inventory management can improve company's inventory control existing situation and decrease costs of the company.

Agent system, in turn, proposes the automation of this process, it can support several forecasting methods and it reacts to changes in the environment.

In this paper, the existing inventory management situation is analysed, twofold improvement is proposed – to use inventory management with the aim to decrease company's inventory level and holding costs by avoiding overstocks and to apply the agent system in order to automate the inventory management processes and to timely react to demand deviations from the forecasted demand by making corrections in replenishment policies.

According to experiments, it can be concluded that timely reaction to changes in the environment can propose better results. This can be done by a human or decision support system comparing the forecasted demand with real and making corrections in orders, or this can be done by an agent as it is proposed here.

The next step of the present research will be the application of achieved results of demand forecasts, safety stock and reorder points into simulation software in order to achieve more accurate results.

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