

# DIFFERENTIATION OF LEVEL OF LOGISTICS ACTIVITIES IN MILK PROCESSING COMPANIES

Ludwik Wicki, Tomasz Rokicki

Department of Economics and Organisation of Enterprises, Faculty of Economic Sciences,  
Warsaw University of Life Sciences (SGGW)

**Abstract.** In this work solutions used in logistics systems in milk processing companies were compared. The logistics solutions in this sector are still insufficiently recognized. A synthetic indicator of the level of logistics in the dairy companies covering all logistical functions was used. Individual weights were assigned to parameters taken under consideration. The results assessed the actual level of logistics in researched companies. Calculated results are describing the level of logistics solutions that were compared with assessments made by managers.

**Key words.** Logistics systems, milk processing branch, agribusiness.

## 1. INTRODUCTION

Among the most important actions performed within the framework of logistics one can list relocation and transportation of goods, warehousing and storage, industrial packaging, manipulation of materials, stocks control, execution of orders, demand forecast, production planning, purchasing, customer service at appropriate level, location of facilities and warehouses, handling of returns, delivery of spare parts and after-sale service as well as wastes collecting and removal. Such large number of actions renders integrated approach to logistics starting already at the products design stage necessary [1, 2].

An important problem for logistics are the levels at which logistics goals are formulated and the choice, and implementation of logistics actions. The most common division is the division into the strategic and operational levels. At the strategic level the logistics strategy is formulated. This means that the basic problems and tasks in the logistics area are specified. Among the most significant ones there is the shaping of the procurement, production organization and distribution concepts. The purpose of operational management is, however, assurance of a harmonious course of the logistics activity [3]

All the actions undertaken in the supply chain should be subject to the pursuit of satisfying customers' needs. They can be of an anticipatory nature, i.e. result

from an earlier analysis of the environment and resources. On the other hand, the actions can be of an adaptation nature, i.e. adept to the current, changing situation in the market [4, 5].

The level of knowledge about the processes of logistics undergoes constant changes. Logistics developed by going through different phases such as: the phase of physical distribution, the phase of internal integration, the phase of logistics engineering, the phase of supply chains [6]. Certain enterprises, especially small ones, are characterized by a low level of logistics development.

Milk processing is one of the agribusiness branches. Solutions concerning logistics in this branch are still not recognized or described in the literature. In the case of milk processing enterprises, one of the key areas of logistics is the obtaining of raw materials, while the choice of appropriate distribution channels decides about the profitability of the conducted activity [7]. The increase in the share of sales through modern distribution channels and the decreased sales through own wholesalers can contribute to a worsened situation in enterprises [8].

## **2. METHODS OF RESEARCH**

The purpose of the paper is to present the level of advancement of logistics processes in the businesses dealing with milk processing in Poland. The following tasks have been completed in order to attain the goal: a poll research covering the most important areas of logistics activity was carried out, the joint indicator of the level of logistics in businesses was defined, the results of assessment of the logistics in the enterprise were compared with entrepreneurs' opinions on the level of the logistics solutions in their companies. The analyses were carried out for all the examined enterprises and in accordance with their size.

The data for the analysis comes from the poll research conducted from January to April 2010. 393 questionnaires were sent out of each 24 were returned, i.e. 6,1%. The poll included questions about the logistics solutions applied in the company in the following areas: logistics organization, stock, warehousing, packaging, transport and IT. Also, questions about the level of knowledge concerning logistics in the company and the assessment of the logistics solutions as compared to the branch were included.

The assessment of the level of the logistics solutions was made with the use of a synthetic indicator covering the particular logistics areas in enterprises: organization of logistics, customer service, stock, warehousing, transport, information technology. The answers collected in questions 2 to 4 were used with reference to each of the areas. The indicator could have values in the range from 0 to 100. The share of the particular partial assessments in the total indicator was as follows: organization of logistics – 15, customer service – 10, stocks – 30, warehousing – 10, packaging – 5, transport – 10, information management 20.

Small enterprises were those which employed up to 50 people, medium-sized enterprises were those which employed from 50 to 250 people, and large ones above 250 people.

To present the results in graphic manner one presented the categorization of the variables in figures 6-8. In literature, it is described by the division method of Nowak [9]. 4 categories were divided:

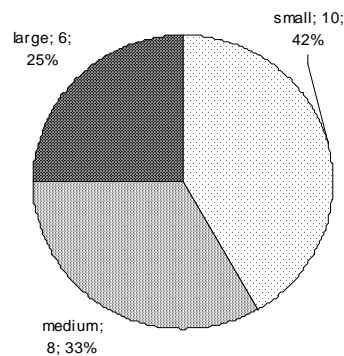
- I category  $[\min x, \bar{x} - s(x)]$ ,
- II category  $[\bar{x} - s(x), \bar{x}]$ ,
- III category  $[\bar{x}, \bar{x} + s(x)]$ ,
- IV category  $[\bar{x} + s(x), \max x]$ ,

where  $\bar{x}$  is the average value,  $s(x)$  is a standard deviation,  $\min x$  is the minimum value, and  $\max x$  is the value of the given feature in the given group.

The strength of the relationship between the estimated value of the synthetic indicator and own assessment of the logistics level and the possessed knowledge in the area of logistics solutions has been defined with the use of rank correlation coefficients of Spearman and Kendall. The calculations have been made in Statistica 9.0 software.

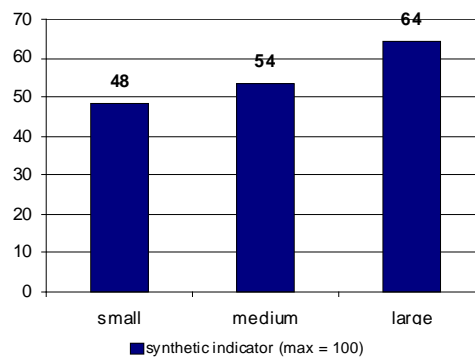
### 3. RESULTS

The research was carried out in 24 enterprises in the milk processing sector. The structure of enterprises has been presented in figure 1. The largest group was constituted by small enterprises – 42%, then, medium-sized – 33%, and large companies: 25% of the examined units.



**Figure 1.** Structure of size of researched enterprises (on base of number of employees).  
Source: results of own research.

The level of the applied solutions in the logistics scope differed in the particular group of enterprises. The highest level was specified for large enterprises: 64,3, while the level for medium-sized enterprises was much lower: 53,5. The weakest assessment was related to small enterprises: 48,2 (fig. 2). The general average assessment for all companies was 54 points. A visible advantage of large and medium-sized companies in the application of advanced solutions in logistics indicates undoubtedly that the necessity of improving logistics processes is strongly related to the extent of activity. It can be related to servicing a much larger number of recipients, a larger geographical reach of activity and a much greater number of assortment items in large businesses [10]. This causes an increase in the number and complexity of relations and requires introduction of increasingly advanced logistics solutions.

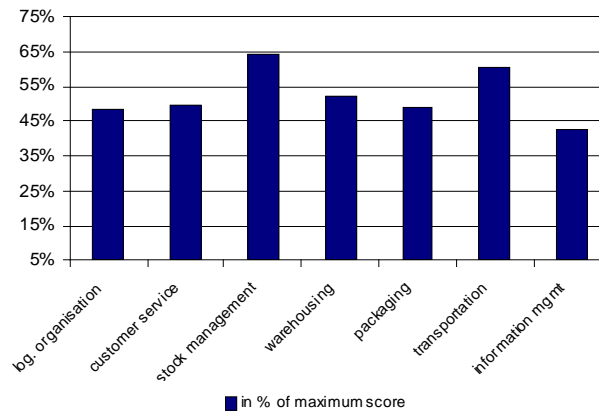


**Figure 2.** The level of synthetic indicator of logistic activity in milk processing companies with regard to their size. Source: results of own research.

The particular areas of logistics have been assessed differently. The highest assessment was given to the applied solutions in the stock and transport management area. The lowest assessment was given to information management and utilization of IT solutions (fig. 3).

The best evaluation concerns the areas connected with traditional logistics functions realized within an enterprise. Stocks management was an important element of company management also in the period when the organizational integration of the particular logistics areas did not take place yet. Solutions in the areas related to integration of logistics solutions in one whole were assessed at a lower level. Both, separation of logistics management in an enterprise and separation of the units responsible for its particular areas in the company as well as utilization of IT systems for data collection, processing and exchange were not common. It led to the situation where assessments in the areas of logistics organization and information management were low. Wicki and Jałowiecki [11] indicate that in spite of the fact that the level of using IT tools in the examined milk processing enterprises has

been evaluated at a relatively low level in today's research in relation to the level of solutions in other areas of logistics, in general it is higher than in other branches of the agricultural-food processing sector.

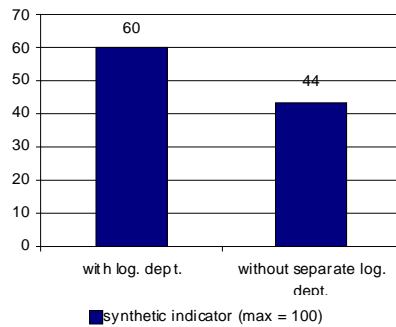


**Figure 3.** Evaluation of functional areas of logistics in milk processing companies (in % of maximum score). Source: results of own research.

There were big differences in the evaluation of the particular functional areas in companies of different sizes. In large businesses, the information area assessment was equivalent with 70% of the maximum value. Similarly high was transport evaluation (81%), management of packaging (72%), or organization of logistics (63%). For comparison, in small companies stocks management areas (72%) and transport (52%) were evaluated at the highest level. In medium-sized companies the best assessment was related to the field of stocks management and organization of logistics but information management in these companies was at the level of 40%.

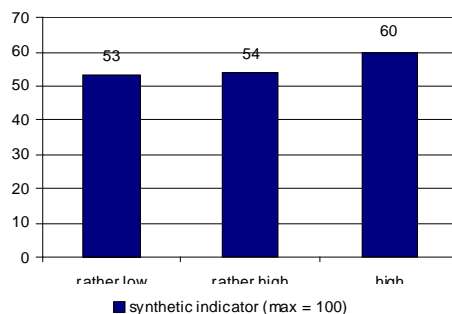
On the basis of the evaluation one can say that together with the growing size of enterprises, the level of the applied logistics solutions was increasing. Most of all, in relation to the organizational separation of logistics departments or organizational units responsible for logistics and in relation to the introduction of logistics information management covering all phases of the flow of materials in an enterprise as well as management of customer relations.

It was also appraised whether separation of the logistics department within the enterprise's structures was connected with the level of logistics actions or it was dictated only by the fashion of changing names. The synthetic assessment of logistics in enterprises with a separated logistics department was considerable higher than in the companies where there was no such department (fig. 4). The assessment difference of 16 points is three Times higher than the one possible to achieve in the logistics organization area in relation to the functioning of the logistics department within a company.



**Figure 4.** Evaluation of synthetic indicator of logistics in enterprises with logistics department and without logistics department. Source: results of own research.

Introduction of changes in a business, including the scope of logistics actions, requires that the management evaluate the existing solutions in the enterprise and the knowledge of possible improvements. The respondents could choose from amongst answer options – if it is completely sufficient or if there are any shortages, or, finally, if it is too poor. Becoming aware that there are knowledge shortages can lead to the gaining of knowledge and introduction of improvements in the company. Figure 5 presents the appraisal of the logistics level depending on the declared level of knowledge in the logistics field.

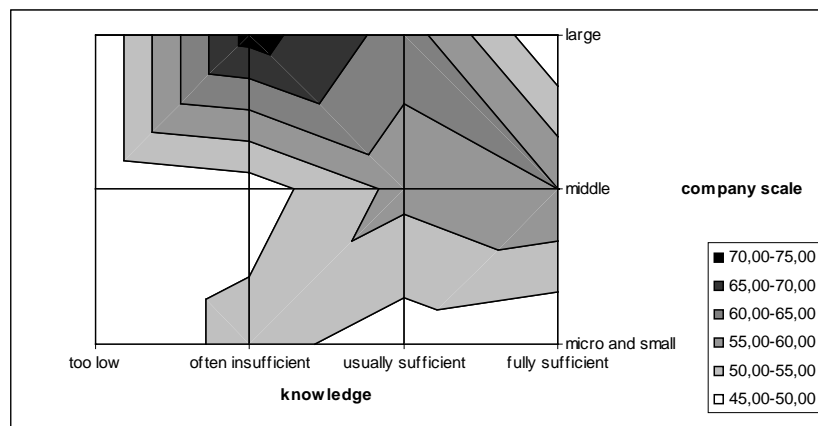


**Figure 5.** Evaluation of synthetic indicator of logistics in dependency on level of declared logistics knowledge level. Source: results of own research.

In none of the companies a low level of knowledge in the area of logistics was declared. The level of synthetic indicator in logistics did not differ for those enterprises for which a rather low and rather high level of logistics knowledge was declared. Only in the enterprises with a declared high level of knowledge the value of the indicator was higher. This means that enterprises often evaluate their own knowledge incorrectly and subjectively. Irrespective of whether they think it is not very good or almost sufficient, they apply similar solutions in logistics. It proves

that in order to recognize the need of changes in the particular area of logistics correctly, one should conduct an external audit of the logistics. It could allow a correct and independent evaluation of the existing solutions and the need for changes. In the agricultural business branches, the level of logistics knowledge in milk processing enterprises was at the highest level. A similar result was obtained only in the sector of fruit and vegetables processing [10].

The evaluation of the level of knowledge in logistics was not connected with the observed level of the applied logistics solutions. In large enterprises which frequently indicate knowledge shortages, the synthetic indicator of the logistics level was above 75. The noted relation is the fact that irrespective of the size of the enterprise, the ascertainment that the logistics knowledge was sufficient was related to the low level of the synthetic indicator (fig. 6). This relation is particularly visible in small and large companies.

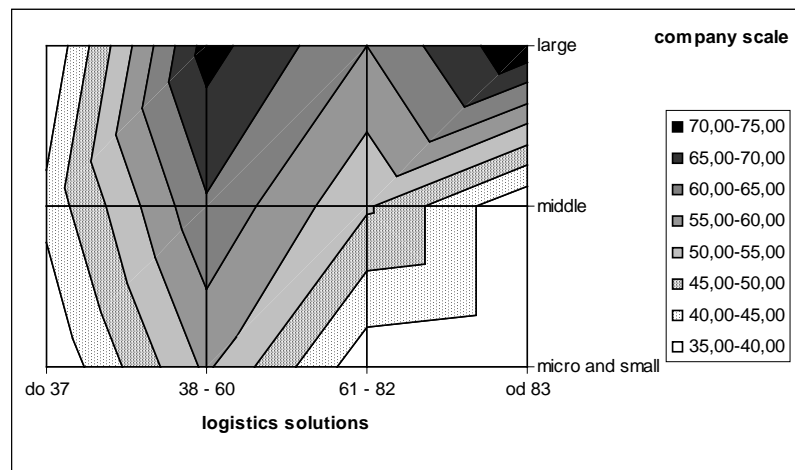


**Figure 6.** Evaluation of synthetic logistics indicator in dependence on the level of declared logistics knowledge and firm size of milk processing enterprises.  
Source: results of own research.

The research covered a request for assessment of the advancement level of the logistics solutions used in the business. One could indicate whether the solutions in the individual logistics fields applied in the enterprise were at the average level within the branch or at a lower or much lower level, or, perhaps, at a higher or a much higher one. Jointly, the maximum number of points in the assessment of solutions could be 100, if the highest Mark for every area was pointer to.

Figure 7 presents the results of the enterprises' self-evaluation in relation to their synthetic indicator. The greatest discrepancies between the self-evaluation and the obtained synthetic indicator were noted in large enterprises. Both, in the enterprises which assessed their solutions below average and in those that evaluated them highly, the calculated synthetic indicator exceeded 70 points. The smaller the

companies were, the bigger their difficulties with a correct diagnosis of applied logistics solutions were.

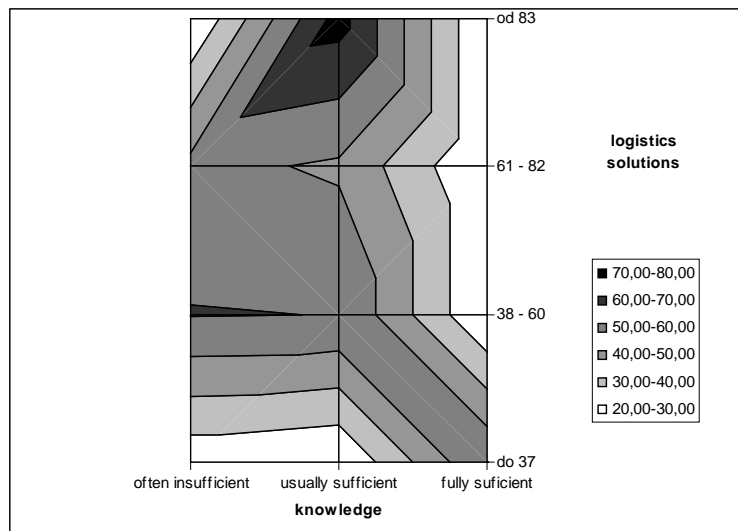


**Figure 7.** Evaluation of consistency between self-evaluation of logistics solutions and calculated synthetic indicator of logistics in dependence on the firm size of milk processing enterprises (classes of self-evaluation solutions were calculated accordingly to Nowak methodology). Source: results of own research.

The analysis of compliance of the assessment regarding the applied logistics solutions within a company and the synthetic indicator of the logistics level shows that the management evaluate their company solutions higher than it is shown by the standard assessment for the whole group of enterprises. Figure 7 presets the consistency of self-evaluation with the evaluation according to the synthetic indicator in enterprises of diverse sizes. The highest level of consistency was reached in large enterprises, for which the estimated synthetic indicator was higher than 60 points. Considerable discrepancies were seen in small and medium-sized enterprises, for which the synthetic indicator did not exceed 50 points. It indicates that the limitation for modernization of logistics actions in small and medium-sized companies is the management's conviction of the correctness of the applied solutions. Figure 8 presents an example of such relations. The highest level of the synthetic indicator has been defined for the companies, in which it was pointed out that the knowledge of logistics was often insufficient and usually sufficient (above 60 points). It is worth adding that in places where shortage in the knowledge were mentioned, the level of the applied solutions, including self-assessment, was below average. In the companies where a sufficient level of knowledge was mentioned, logistics solutions applied therein were, at the same time, assessed highly. It is significant that part of the companies, in which it was deemed that the logistics



knowledge was sufficient had a low evaluation of the applied logistics solutions. Their self-assessment was at a lower level than the synthetic indicator defined for these companies. It means that part of entrepreneurs may not feel the need of improving their logistics processes.



**Figure 8.** Evaluation of consistency between declared level of knowledge in logistics and calculated synthetic indicator of logistics in dependence on self-evaluation of logistics solutions in milk processing enterprises (classes of self-evaluation solutions were calculated accordingly to Nowak methodology). Source: results of own research.

The relation between self-evaluation of the level of logistics and the synthetic assessment was appraised also with the use of correlation coefficients. The calculated indicator of correlation of the order of ranks by Spearman was 0,065, which means that the relation between self-assessment of the logistics level and the synthetic indicator of the logistics level assessment was not proven. The correlation coefficient tau by Kendall for these variables was 0,035 and it also indicates the independence of the analyzed values. Also, base don the statistical evaluation of the dependencies, one can say that the level of logistics solutions in the examined enterprises was not evaluated correctly.

#### 4. CONCLUSION

The research was an attempt of assessing the level of logistics solutions in milk processing enterprises. The synthetic assessment indicator was used in the assessment. The structure of this indicator covers the basic logistics functions.

Large enterprises have been evaluated at the highest level – on average, 64 in the 100 points' scale. It was lower in medium-sized and small enterprises, accordingly 54 and 48 points, respectively. The assessment diversification can result both, from the fact that small companies act in local markets and serve a small number of recipients – it does not cause the necessity of using more advanced technology in the enterprise's logistics and from the fact that they have limited organizational and financial possibilities regarding introduction of advanced solutions in the area of logistics.

The highest assessment was the assessment of those logistics areas which were developed in the period before the popularization of the integrative (joint) formulation of logistics. It was the stocks management zone (the assessment was 65%) and transport management (60%). The lowest evaluation mark was given to the solutions in areas such as packaging management and return logistics as well as management of logistics information (49% and 43%, respectively).

The logistics functions developed in enterprises as early as in the period before the integration of the areas related to logistics are much better implemented than those related to the integrative, all-embracing approach to the management of the flow of goods and information, which is represented by the logistics perceived in the contemporary world. Thus, many enterprises never undertook any actions aimed at strengthening of their position in the market through better logistics service at all. It is necessary that information concerning correct and proper logistics solutions for different sizes of companies is disseminated. This will enable entrepreneurs both, to make savings in the scope of the costs of stocks, warehousing, packaging and transport but also achieve benefits in relation to a higher customer service level.

The level of advancement of logistics solutions was correlated positively with the organizational separation of the logistics department within the company structure. This means that the fact that in the given enterprise there is a separate department dealing with logistics can be one of the indicators of the logistics level.

It has been ascertained that the declared level of logistics knowledge is merely connected with the quality of logistics solutions. Only in the group of entrepreneurs in which a high logistics knowledge level was declared one obtained a significantly higher synthetic assessment of logistics. For the remaining levels of knowledge, from insufficient to almost always sufficient, the level of the applied logistics solutions in enterprises did not differ.

In the world of the conducted analyses, one can also formulate a thesis that the limited possibilities of improving actions in the logistics scope result from the excessively high self-assessment with reference to the logistics solutions applied in enterprises. It was found in the research that the differences between the internal and external assessment of activeness in logistics in enterprises are higher in small and medium-sized enterprises. This means that in spite of the most often declared

sufficient level of knowledge in the field of logistics, the applied solutions diverge from the recommended practices. The most frequent shortages were related to areas such as: utilization of formal tools for stocks management, appointment of the people responsible for all logistics actions, active management of transport which consists in optimized routes and cargo capacity of vehicles, use of automatic identification by bar codes, use of modern channels of communication with recipients or information integration within one IT system.

*Research granted by Ministry of Science and Higher Education from the funds for science in years 2009-2012 as a scientific project no N N112 049637 "Procesy logistyczne w funkcjonowaniu przedsiębiorstw przetwórstwa rolno-spożywczego".*

#### **REFERENCES**

- [1] Coyle J. J., Bardi E. J., Langley Jr C. J. (2007) *Zarządzanie logistyczne*, PWE, Warszawa, 69-73.
- [2] *Procesy i projekty logistyczne* (2008) red. Nauk. Nowosielski S., Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław, 28-31.
- [3] Zielińska E., Lejda K. (2010) *Analiza i modelowanie procesów logistycznych w zapleczu technicznym transportu samochodowego w aspekcie problemów ekologicznych*, Wydawnictwo Politechniki Rzeszowskiej, Rzeszów, 75-76.
- [4] *Logistyka* (2009), red. nauk. Kiperska-Moroń D., Krzyżaniak S., Biblioteka Logistyka, Poznań, 99.
- [5] *Logistyka. Wybrane zagadnienia* (2008) Wydawnictwo SGGW, Warszawa, 7-8.
- [6] *Rynek usług logistycznych* (2005) red. nauk. Ciesielski M., Difin, Warszawa, 10-11.
- [7] Cymanow P. (2009) *Obszary zarządzania procesami logistycznymi w branży przetwórczej*, Roczniki Naukowe SERiA, t. XI, z. 1, Wydawnictw Wieś Jutra, Warszawa-Poznań-Olsztyn, 65-71.
- [8] Zuba J. (2009) *Kanały dystrybucji produktów mleczarskich instrumentem ekonomicznej konkurencyjności mleczarni*, Roczniki Naukowe SERiA, t. XI, z. 1, Wydawnictw Wieś Jutra, Warszawa-Poznań-Olsztyn, 491-496.
- [9] Nowak E. (1990): *Metody taksonomiczne w klasyfikacji obiektów społeczno-gospodarczych*. PWE, Warszawa.
- [10] Rokicki T. Wicki L (2010): *Skala działalności, obszar działania a wymagania w zakresie logistyki w przedsiębiorstwach sektora rolno-spożywczego*. *Logistyka* 3, 1-15.
- [11] Wicki L., Jałowiecki P. (2010): *Zróżnicowanie poziomu organizacji logistyki w wybranych branżach agrobiznesu*. *Logistyka* nr 3, 1-21.

WARSAW UNIVERSITY OF LIFE SCIENCES (SGGW)  
DEPARTMENT OF INFORMATICS

# **INFORMATION SYSTEMS IN MANAGEMENT X**

**Computer Aided Logistics**

Scientific editors

*Piotr Jałowiecki*  
*Arkadiusz Orłowski*

WULS Press Warsaw 2011

Copyright by Department of Informatics SGGW  
Warszawa 2011, I edition

Reviewers:

Dr Marcin Bator

Prof. dr hab. Ryszard Budziński

Dr hab. Leszek Chmielewski, prof. SGGW

Prof. dr hab. Ludosław Drelichowski

Dr Urszula Grzybowska

Dr inż. Piotr Jałowiecki

Dr Krzysztof Karpio

Dr Waldemar Karwowski

Dr Rafik Nafkha

Prof. dr hab. Marian Niedźwiedziński

Dr hab. Wiesław Szczesny, prof. SGGW

Dr hab. Antoni Wiliński, prof. ZUT

Typesetting and prepress:

Dr Piotr Łukasiewicz

ISBN 978-83-7583-265-5

Wydawnictwo SGGW

02-787 Warszawa, ul. Nowoursynowska 166

Tel. (022) 593 55 20 (-22 – sprzedaż), fax 593 55 21

e-mail: [wydawnictwo@sggw.pl](mailto:wydawnictwo@sggw.pl), [www.wydawnictwosggw.pl](http://www.wydawnictwosggw.pl)

Print: Agencja Reklamowo – Wydawnicza A. Grzegorzcyk, [www.grzeg.com.pl](http://www.grzeg.com.pl)