

UNIVERSITY OF NATURAL RESOURCES AND LIFE SCIENCES
DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY FOOD QUALITY ASSURANCE
MSC SAFETY IN THE FOOD CHAIN
STUDY CODE: H451



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TRAINING ON HYGIENIC DESIGN IN MEAT INDUSTRY

MASTER THESIS TO OBTAIN A MASTER DEGREE AT UNIVERSITY OF NATURAL RESOURCES AND
LIFE SCIENCES, VIENNA

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VIENNA, 2014

ACKNOWLEDGEMENT

All truths are easy to understand once they are discovered.

The point is to discover them.

Galileo Galilei

With respect and gratitude I would like to express my thanks to Ass. Prof. Dipl.-Ing. Dr. Gerhard Schleining for giving me an interesting topic; my thankfulness for patient and supporting. Thank You for having an open mind for discussion of our topic.

A sincere thank you to the members of the MSc Safety in The Food Chain group, all my professors and my friends who accompanied me in this 2-year. I enjoyed working with you.

My sincere gratitude goes to my family for their support throughout my studies.

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ABSTRACT

Hygiene plays a very important role in food processing. The meat industry is a dangerous area where pathogenic bacteria and microorganisms may grow. If the meat processing occurs in unhygienic conditions, there might be serious problems with meat and meat products.

The goal of this master thesis is to provide training methods for students and for employees of the meat industry. Especially for small and medium sized plants. A handbook and PowerPoint slides for face to face training have been produced. These deal with topics in meat processing such as microbial, chemical and physical hazards, hygienic design criteria for building and equipment, hygiene control measures, cleaning & sampling methods & procedures, and auditing. The PowerPoint slides may be modified and/or translated for training in different countries.

These materials have further been used as self-studying materials in an e-learning course, which has been made available in the training platform of the ISEKI – Food Association (<https://www.iseki-food.net/moodle/>). Besides these the e-learning course has also activities like assignments, discussion forums and quizzes. The results have been used and evaluated by experts.

ZUSAMMENFASSUNG

Hygiene spielt eine sehr wichtige Rolle in der Lebensmittelverarbeitung. Die Fleischindustrie ist dabei ein besonders heikler Bereich im Hinblick auf das Wachstum von pathogenen Bakterien und anderen Mikroorganismen. Findet die Fleischverarbeitung unter unhygienischen Bedingungen statt, kann es zu ernstzunehmenden Problemen mit Fleisch und Fleischprodukten kommen.

Das Ziel dieser Masterarbeit ist es, Trainingsmethoden für Studierende und Angestellte der Fleischindustrie, insbesondere für kleine und mittlere Betriebe, bereitzustellen. Zu diesem Zweck wurden sowohl ein Handbuch sowie PowerPoint-Folien für persönliche Schulungen erstellt. Diese Unterlagen behandeln verschiedene Themen der Fleischverarbeitung, wie zum Beispiel mikrobiologische, chemische und physikalische Kontaminanten, hygienische Gestaltung von Gebäuden und Ausrüstung, Maßnahmen zur Kontrolle der Hygiene, Reinigungs- und Probenahmemethoden und -abläufe sowie Auditierungen. Die PowerPoint-Folien können gegebenenfalls für Trainings in verschiedenen Ländern modifiziert und übersetzt werden.

Die Unterlagen wurden zudem zum Selbststudium in Form eines e-Learning Kurses verwendet, welcher auf der Trainings-Plattform der ISEKI – Food Association (<https://www.iseki-food.net/moodle/>) veröffentlicht wurde. Zusätzlich beinhaltet der e-Learning Kurs interaktive Elemente in Form von Aufgabenstellungen, Diskussionsforen und Quiz. Die Ergebnisse wurden von Experten evaluiert.

1. INTRODUCTION

According to money circulation (800 milliards euros per year), exports, and number of employees, the food sector is one of the largest in the European economy. In Lithuania, a similar index exists – food sector is one of the biggest in the country, which has a profound influence to the national economy. The European Union's and Republic of Lithuania's food laws and regulations play an important role for a safe 'farm to fork' food and for reliable source of information [2].

According to the Lithuanian Meat Department statistics in 2013 the total amount of livestock and poultry purchased, processed, and butchered in Lithuania amounted to 41,6 thousand t. (live weight – 62,4 thousand t.). Compared with 2012 purchases increased about 14%. Pork exports rose to 68% to 3,4 thousand tons of pork exported. 37.1% was exported to EU countries (mostly to Latvia). Sausage exports grew 22% and reached 4.3 thousand t. [7].

Hygiene is one of the main issues in food processing chain. It directly effects the quality of the food. Moreover, the correct design of equipment may help to keep a hygienic environment in the plant.

Consumer safety is the primary challenge for the meat producers. Meat safety is related to consumer confidence. The manufacturers are responsible for producing safe meat & meat products.

The objective is a hygienic design of the plant and equipment. All equipment like slicers, cutters, trolleys, pails etc. must be cleaned and sanitized prior and after production. The hygienic design of the facility provides a basis for hygiene control in the design, construction and renovation of meat factories. With all due respect to producers, auditing is also a significant method to ensure the safety of meat and meat products. Equipment with poor hygienic design accumulate dust and soil where microorganisms may grow, resulting in food poisoning incidents.

Therefore, it is important that the producers and facility employees be well trained about the food safety regulations and instructions of safe work.

In the Republic of Lithuania are several regulations of food hygiene. According to Lithuanian food safety and hygiene norms HN 15:2001, meat production facilities are required to adhere to strict rules and guidelines [6]. These laws include good hygiene practices, food safety regulations, premises, equipment, and property management, worker management, sanitation management, risk analysis, and HACCP system. All these are in regards to food safety.

Employees who are working in meat industry should have a certificate of safe food and a certificate of hygienic skills. Moreover, once in six months each employee must repeat his basic skills of safe practices for working in meat plant. A trainer must be qualified. Quality managers, professors, lecturers or food quality specialists could work as trainers. These kind of trainings should be done regularly in a plant.

Once a year, all employees should study correct machine & instrument handling, cleaning and disinfection, and hygienic behavior in a meat manufacturing factory. That kind of training may be done in specialized courses in State Food and Veterinary Service or in Aleksandras Stulginskis University.

Furthermore, in Lithuania there are currently several projects funded by EU. Development funds provided by the European Union created the project, 'A professional course for educators creating, implementing, maintaining, and managing systems'. The pedagogical content includes information on technological aspect of meat and poultry processing, workplace safety instruction, food safety and food management system [3].

In Lithuania, we do not have any e-learning platforms. Unfortunately, employees can not study offsite. This problem has to be solved.

Good Manufacturing Practise (GMP) covers all measures of production, starting with welding, crevices, surface materials, and employee training method. GMP provides the framework of meat production which is referred to as Good Hygienic Practise (GHP). The aim of GHP is the quality and not the quantity. GHP's concept is to implement preventative measures in order to provide safe food.

The HACCP program includes a equipment maintenance program, worker training program, equipment inspection program, sanitation program and cross connection control problems.

The training materials are for employees who are working in small or medium scaled meat manufacturing plants. Moreover, students who are studying or interested in hygienic design topics may study the learning materials.

Hygienic design is mainly provided from the guidelines of the European Hygienic Engineering and Design Group (EHEDG). The EHEDG is a consortium of equipment manufacturers, food industries, research institutes as well as public health authorities.

In the web site of EHEDG [5] the guidelines are aimed to promote hygiene in the meat processing and packaging of meat and meat products. Thus, they explain hygiene during the

processing and packaging of food products and the general principles which must be considered in design of equipments and in control of processes.

Some guidelines of EHEDG, which are related with hygienic design in meat industry are listed below:

- Doc. 2: A method for assessing the in-place cleanability of food processing equipment.
- Doc. 9: Welding stainless steel to meet hygienic requirements.
- Doc. 11: Hygienic packaging of food products.
- Doc. 13: Hygienic design of equipment for open processing.
- Doc. 14: Hygienic design of valves in food processing.
- Doc. 18: Chemical Treatment of Stainless Steel Surfaces.
- Doc. 32: Materials of construction for equipment in contact with food.

National Sanitation Foundation (NSF) is an independent, accredited organization. This organization tests, audits and certifies products and systems as well as provides education and risk management. The NSF traditionally has developed standards for equipment used in food service. Now it is possible to have equipment used in the processing of meat and poultry certified against ANSI/NSF/3-A Standard 14159-1-2000. This standard has been specified by the USDA (United States Department of Agriculture) as the standard for the evaluation of equipment used in processing meat and poultry [8].

Moreover, European Committee of Standardization (CEN) promote the unique European Standardization System and its results. In the web site of CEN [4] the standards promote hygiene in meat processing.

Examples of CEN standards for the food industry:

- EN 12267:2003 Food processing machinery - Circular saw machines
- EN 12268:2003 Food processing machinery - Band saw machines
- EN 12355:2003 Food processing machinery - Derinding-, skinning- and membrane removal machines
- EN 12852:2001 Food processing machinery - Food processors and blenders
- EN 1974:1998 Food processing machinery - Slicing machines
- EN 454:2000 Food processing machinery - Planetary mixers

Examples of CEN standards currently under approval:

- prEN 13288 Food processing machinery - Bowl lifting and tilting machines
- prEN 12331 Food processing machinery - Mincing machines (Ratified)
- prEN 13870 Food processing machinery - Chop cutting machines
- prEN 13871 Food processing machinery - Cubes cutting machines
- prEN 13534 Food processing machinery - Curing injection machines

American 3-A Sanitary Standards Organization is also a related foundation which is specifically working for hygienic design in the meat industry. 3-A SSI is an independent, not-for-profit corporation dedicated to advancing hygienic equipment design for the food. 3-A criteria is universally accepted by equipment manufacturers, fabricators, users and sanitarians. With a purpose of enhancing food safety by promoting hygiene in the production, National Sanitation Foundation and American 3-A Sanitary Standards organization have many aims. The NSF and 3A have recently collaborated in standards development for meats and poultry equipment (3-A/NSF 14159). It is a Hygiene Requirements for the Design of Meat and Poultry Processing Equipment. Now, users of meat processing equipment know, that their equipment can be anticipate that inspections will go smoothly when equipment complies with 3-A standards [1]. The Lithuanian organs of government do not organize any regular workshops for employees who are working in the meat industry. On the other hand, there are many organized training projects for employees. These projects are funded by EU. One of that project is called '*Employee Safety and Health*' [9]. It is a Business Support Programm II suitable for small and medium scaled plants. Employees may learn more about risk assessment in the meat plant, meat safety, personal dressing, electrical installations etc.

Furthermore, employers are sending their quality managers to attend seminars or courses in Lithuania, or even in foreign countries. All expenses are paid by employers or by quality managers. Moreover, in Lithuania are several companies who are working on training courses. For example, that kind of consultancy firms may organize a specialized trainings for employees who are working in the meat industry.

One efficient method of studying from the internet is completing an e-learning course. E-learning is the use of electronic media and information and communication technologies in education. It is broadly used nowadays. E-learning in learning and education refers to the use of modern technology, such as computers, digital technology, networked digital devices (e. g.,

the Internet). E-learning includes numerous types of media that deliver text, video, images, and animation.

It can be self-placed, may be trainer-led and a time saving way of learning. E-learning is suited to distance learning and flexible learning, but it can also be used in conjunction with face to face teaching (blended learning). Unfortunately, students may feel isolated from the trainer and classmates. Similarly, the trainer may not always be available when students are studying need help. Moreover, slow Internet connections or older computers may make accessing course materials frustrating.

The ISEKI-Food Association (IFA, European Association for Integrating Food Science and Engineering Knowledge Into the Food Chain, <http://www.iseki-food.net/>) is an independent European non-profit organisation, established in 2005 by university institutions, research institutes, companies, and associations related to food, coming from all over the world. IFA provides an e-learning platform, using an open access learning and content management system moodle (<https://moodle.org/>). This is a software package for producing Internet-based training courses, which allow to arrange learning materials like pdfs, videos, images, figures, and activities like chats, discussion forums to ask and answer questions or assignments where the participants can upload their work as PowerPoints or other documents, etc.

2. PROBLEMS AND HYPOTHESIS

A main goal of meat processing facilities is quality control of their products. To achieve this objective worker training and development is crucial. In big scaled companies all employees are well trained in compulsory courses. However, within smaller and medium sized processing facilities and slaughterhouses worker training and development is lacking. To achieve this objective worker training and development is crucial. In European Union, there are 13.000 of meat companies. These companies employ 350.000 workers. The profit is about 85 milliard Euros per year [10].

According to Lithuanian Agricultural statistics in the Republic of Lithuania in 2013 there were 121 slaughterhouses and meat product producing companies: 6 large scaled companies, medium and small scaled companies include 99 and only 15 slaughterhouses [11]. The number is varying every year. A problem the companies confronted are poor design, mistakes in design, or unhygienic conditions. Similarly, untrained or poorly trained employees are a potential risk of producing unsafe food. Product spoilage might occur because of the detrimental employee behaviour. All the solutions to those problems can be solved by training and education.

This master thesis should close this gap by providing adaptable training materials for medium and small scaled companies in the meat industry to be used for onsite training and distance learning.

3. MATERIALS AND METHODS

In order to provide adaptable training materials for medium and small scaled companies in the meat industry to be used for onsite training and distance learning 3 materials are produced:

1. A handbook of hygienic design in meat processing plants.
2. PowerPoint presentations for training in meat processing plants.
3. E-learning course: Hygienic Design in Meat Industry, which is available in an international platform ISEKI – Food Association (<https://www.iseki-food.net/moodle>).

The scope of these materials is on hygiene management, equipment design, equipment integration into the plant interior, GHP, cleaning and sanitation methods, sampling procedures and auditing.

The handbook and PowerPoint slides are developed for onsite, face to face training, whereas the e-learning course can be used from anywhere and any time even within one's home.

3.1. Handbook of Hygienic Design in Meat Industry

This text book is for employees who are working in the meat industry, and students as well, who are studying hygienic design and any other interested persons.

Within the meat industry there is a wide range of products. Therefore, was difficult to decide areas to focus on. Therefore, I consulted with professors and authors about hygienic design in the meat industry. Finally, topics were selected after consulting other materials: published books, handbooks, guidelines, scientific articles, web-sites.

Even so, it was difficult to narrow down a focus in such a broad and diverse industry as meat processing and production. The decision was finalized due to the fact most Lithuanians prefer and consume pork and poultry compared to other meats. The information presented will cover poultry butcheries and processing facilities and pork butcheries and processing facilities. Poultry manufacturing plant is producing freeze raw cutted poultry parts. Pork manufacturing plant is producing hot and cold smoked sausages, minced meat, lithuanian traditional sausages, cold smoked hams, wither sausages, boiled sausages, meat pate and corned beef.

I prepared many specific questions for technologists before each plant visiting. The food technologists helped me find out right answers after long lively discussions. During plant visits, I took many photos of correct and wrong examples of hygienic design. Unfortunately, the

managers of the meat plants want to remain anonymous. The other figures and tables have been used from other scientific sources. The permissions were taken from credible authors. I have collected all information and produced a handbook in Microsoft Office Word and PowerPoint presentations. Moreover, for the easier use the handbook may be printed.

3. 2. PowerPoint Presentation for Hygienic Design in Meat Industry

To teach employees and students I have made a presentation, which is divided into different topics. The main and sub-topics have been made accordingly to a handbook. This training material may be used as a general principle of hygienic design.

Microsoft Office PowerPoint program, version 10 has been used to make a presentation. The pictures were used from a slaughterhouse, poultry and pork manufacturing plants to clarify sub-topics. The pictures were self-made. The learning aims and summaries were specified for each sub-topics. This method helps the viewer quickly find out and understand goals of a sub-topic.

These presentations will easily be used to train the volunteers and employees who are currently related to the meat manufacturing processes, students who are studying in hygienic design, or people who want to create a new meat or poultry manufacturing plant to understand a requirements of plant and equipment hygienic design.

3.3. E-learning course: Hygienic Design in Meat Industry

The subject and training of hygienic design in meat industry can be clarified in a few ways, but recently the internet and social networks play a big role in our lives. Due to this reason, an e-learning course has been created to pass on information using the moodle based e-learning platform of the international ISEKI-Food Association.

After reviewing and analyzing the information a student or worker has the opportunity to access what knowledge they have gained after each presentation. At the end of the course there are 2 quizzes, based on multiple choice, true/false, writing a correct words and putting in a right order questions. The participants may check his or her knowledge and quickly get correct or wrong answers via an online test.

The goal of this e-learning course is to encourage people who are interested in Hygienic Design in the Meat Industry, the potential hazards in meat manufacturing plants, control

measures, conditions of equipment installation, hygienic building design, GMP, cleaning & disinfection, sampling procedures for the facilities. The e-learning course is also created with possibility to express one's opinions, complete tasks and a quiz. Activities consist of assignments, chat, feedback, forum, slideshow and etc. Discussion forums are used for each topic for asking and answering questions, sharing personal opinion or personal practices.

If people would like to participate in this course, they should create a username and password. Then, follow the instructions of the course. The achievement of the learning course will be assessed by the tasks and by completing an online quiz. The 'Quiz for Exam' can be done several times. There are multiple choice, true/false, writing in correct words and putting questions in a right order. The 'Final Exam Quiz' can be done at once, after practicing the 'Quiz for Exam'. Both parts consist of 27 questions. The achievement of the learning outcomes will be assessed by evaluating the assigned tasks and the final exam. The final grade is composed by 60% of the tasks and 40% of the final exam.

4. RESULTS & DISCUSSION

4. 1. Handbook of Hygienic Design in Meat Industry

After exploring all related subjects of the hygienic design in meat manufacturing plants, a handbook was produced. It corresponds to small and middle scaled plants.

In this set of materials, a few plants are producing different kinds of sausages and hams, manufacturing facilities processing raw pork and poultry meat are visited to see ongoing processes. Answers to the many questions below are located in the handbook. Information could be used as a searching source for producing the handbook.

The following questions helped me to create the handbook:

- How a plant is generally designed?
- What are the advantages and disadvantages of the plant?
- What should be improved?
- How is the equipment integrated?
- How is the equipment (open and closed) cleaned? How often?
- Zones and barriers in plant?
- Where are the rest rooms?
- How is the sampling applied?
- How does auditing occur?
- How are the good manufacturing practices efficient?
- Where are the refrigeration rooms?
- Where are the loading bays?

The raw meat and meat product technologists have answered all these questions. With kind permission from technologists I took many pictures during processing. Three main parts in the handbook are built up to classify the subjects under topics:

❖ PART I: RISKS IN THE MEAT INDUSTRY

- Hygiene and Hygienic Design
- Hygiene Control in the Meat Industry
- Hazards in the Meat Industry

❖ PART II: HYGIENIC DESIGN

- Building Design

- Equipment Design

❖ PART III: HYGIENE MANAGEMENT

- Risk Assessment in the Meat Industry
- GMP in the Meat Industry
- Cleaning & Disinfection in the Meat Industry
- Sampling & Testing
- Hygiene Audit

The whole 'Handbook of Hygienic Design in Meat Industry' can be found in the ANNEX I as one of the final outcome of the master thesis.

4. 2. PowerPoint Presentations for the Handbook of Hygienic Design in Meat Industry

Visual learning is an effective method for studying, which can be achieved by using PowerPoint presentations. A trainer is using figures, pictures, photos. Thus, it is easy to create, attractive designs using the standard templates and themes, and easy to modify compared to other visual aids. Moreover, it is simple to present and maintain eye contact with an audience. Unfortunately, basic equipment is required to present. A trainer needs to have a computer and projection equipment in place to display the slides to the audience.

The PowerPoint presentations are created for the use of the meat plant employees and students. They were created in conformity with the handbook. The PowerPoint presentations have also been used in the e-learning course: Hygienic Design in Meat Industry. These PowerPoint presentations are published on an international platform ISEKI – Food Association.

The topics that are explained with the PowerPoint presentations are:

- General Knowledge of Hygienic Design
- Microbial Hazards in Meat Industry
- Hygiene Control Measures in Meat Processing
- Building Design
- Zoning
- Electrical Installation

- Walls
- Design of Floors
- Open Equipment in Meat Processing
- Cleaning and Disinfection
- Good Manufacturing Practise in Meat Plant

These presentations may be found in the ANNEX II as the outcome of the master-thesis.

4. 3. E-learning Course: Hygienic Design in Meat Industry

The Learning Outcomes of the course are specified as: After successful completion of this e-learning course, participants will have knowledge of hazards in meat plants, of GMP, GHP and hygienic design of building and equipment, zoning and of cleaning and disinfection and will be able to evaluate equipment and suggest improvements.

The e-learning course of 'Hygienic Design in Meat Industry' is published in ISEKI platform (<https://moodle.iseki-food.net>). Each participant needs to create an account before being able to log-in to the ISEKI platform. After each slide show are tasks related to the presentation. The tasks are to apply the knowledge, learned in the self-study materials. The course consists of seven chapters. Each chapter consists of self-study material and activities, where participants should do some tasks. In the end of the course is a quiz: 'Quiz for Exam'. It can be done several times. There are multiple choice, true/false and putting in the right order questions. After practicing with the quiz, the 'Final Exam' can be done only once. The final grade is composed by 60% of the tasks and 40% of the final exam. The structure of the e-learning course is shown in the following.

HYGIENIC DESIGN IN MEAT INDUSTRY

E-LEARNING COURSE

- **Announcement:** here news is announced from the trainer in this forum.

Chapter 1: Quality Assurance.

In order to continuously improve the quality of the course we want you to:

- After each PowerPoint presentation are tasks. Please, answer these tasks.
- Report problems or proposals for improvements.

- Write a letter to the next participants: 'What should you know for a successful participation'.
- Write a letter to the trainer: 'What should you consider when giving the course next time'.

Chapter 2: Introduction

Introducing the Participants: In this forum the participants write information about themselves: please, describe yourself / your backgrounds. What do you study? Where do you study? Why do you interesting in ISEKI platform? Do you have any experience (job, internship) in meat industry?

Afterwards, is published a Handbook of Hygienic Design in Meat Industry (pdf). In the following part of this course participants may find presentations and activities to deepen and apply knowledge on the following topics:

- General Knowledge of Hygienic Design
- Microbial Hazards in Meat Industry
- Hygiene Control Measures in Meat Processing
- Building Design
- Zoning
- Electrical Installation
- Walls
- Design of Floors
- Open Equipment in Meat Processing
- Cleaning and Disinfection
- Good Manufacturing Practice in Meat Plant

Chapter 3: General Knowledge of Hygienic Design

- Self-study material on General Knowledge of Hygienic Design

Afterwards, tasks to be carried out:

- ❖ What is your opinion about the hygienic design? Does hygienic design of equipment and building plays an important role in safe food?
- ❖ Hygienic design comprises with many things. What are they?
- Self-study material on Microbial Hazards in Meat Industry (pdf)

Afterwards, tasks to be carried out:

- ❖ Please post a contribution about this chapter, something which has not been mentioned in the presentation, but you want to share with other participants.
- ❖ Discussion forum on microbial hazards in meat industry.

- Self-study material on Hygiene Control Measures in Meat Processing (pdf)

Afterwards, task to be carried out:

- ❖ Which parameters influence the hygiene control measures in meat plants. What is your opinion?

Chapter 4: Building Design of Meat Factories

- Self-study material on Building Design (pdf)

Afterwards, task to be carried out:

- ❖ 5th slide shows an example of layout of a meat plant. What would you improve/change?

- Self-study material on Zoning (pdf)

Afterwards, task to be carried out:

- ❖ Please, write a definition of 'zoning' term and its importance on the general hygienic design terms.

- Self-study material on Electrical Installation (pdf)

Afterwards, task to be carried out:

- ❖ What would you improve in the Fig. below?



- Self-study material on Walls (pdf)

Afterwards, task to be carried out:

- ❖ Walls made by metal panels have a problem with condensation. What would you do to avoid this disadvantage?

- Self-study material on Design of Floors (pdf)

Afterwards, task to be carried out:

- ❖ What would you improve in the Fig. below?



Chapter 5: Equipment Used in Meat Industry

- Self-study material on Open Equipment in Meat Processing (pdf)

Afterwards, task to be carried out:

- ❖ What would you improve in the Fig. below?



Chapter 6: Cleaning & Disinfection

- Self-study material on Cleaning & Disinfection (pdf)

Afterwards, task to be carried out:

- ❖ Please, write a cleaning and disinfection plan for a slaughterhouse.

- Self-study material on Good Manufacturing Practice in Meat Plant (pdf)

Afterwards, task to be carried out:

- ❖ What would you improve in the Fig. below?



Chapter 7: Assessment

The achievement of the learning outcomes will be assessed by evaluating the assigned tasks and the final exam. The quiz for exam is not assessed but can be used to practice the final exam. It can be done several times. There are multiple choice, true/false, putting in a right order questions. After practicing with the quiz, the final exam can be done only once. The final grade is composed by 60% of the tasks and 40% of the final exam.

- Quiz for Exam
- Final Exam

AN OVERVIEW OF THE E-LEARNING COURSE:

The screenshot shows the IFA E-learning Platform interface. At the top, it says 'IFA E-learning' and 'English (en)'. A user is logged in as 'Sarune Zasytyte'. The main header is 'IFA - E-learning Platform'. On the left, there is a 'NAVIGATION' menu with links to Home, My home, ISEKI Food E-learning, My profile, My courses, and Courses. Below this is an 'ADMINISTRATION' section with 'My profile settings'. A 'CALENDAR' for May 2014 is also visible. The main content area is titled 'Courses' and lists several training modules under the 'TRAINING' category, including 'Hygienic Design in Meat Industry (2 ECTS)', 'How to use ISEKI e-learning tool', 'Introduction to e-learning courses', 'Introduction to teaching and learning strategies applied to food studies (5 ECTS)', 'Residue processing for a sustainable food industry (2 ECTS)', 'Food Canning', 'Food Packaging', 'Freezing/Thawing (2 ECTS)', 'Computer Applications in Food Processing and Quality Assurance (2 ECTS)', and 'Hygienic Design and Cleaning Validation (2 ECTS)'. On the right, there is an 'ONLINE USERS' section showing 'Sarune Zasytyte' (last 10 minutes) and a 'MAIN MENU' with a 'Site news' link.

Figure 1. The main page of e-learning courses after your successful login.

IFA E-learning English (en) You are logged in as Sarune Zasytyte (Log out)

Home > My courses > TRAINING > Hygienic Design in Meat Industry (2 ECTS) Turn editing on

IFA - E-learning Platform

HYGIENIC DESIGN IN MEAT INDUSTRY (2 ECTS)

NAVIGATION

- Home
- My home
- ISEKI-Food E-learning
- My profile
- Current course
 - Hygienic Design in Meat Industry (2 ECTS)
 - Participants
 - Badges
 - General
 - QUALITY ASSURANCE
 - INTRODUCTION
 - GENERAL KNOWLEDGE OF HYGIENIC DESIGN
 - BUILDING DESIGN OF MEAT FACTORIES
 - EQUIPMENT USED IN MEAT INDUSTRY
 - CLEANING & DISINFECTION
 - ASSESSMENT
 - My courses
 - Courses

ADMINISTRATION

- Course administration
 - Turn editing on
 - Edit settings
 - Users
 - Filters
 - Reports

TARGET GROUP:

This course is for employees who are working in the meat industry, students who are studying in hygienic design and any other interested persons.

Announcement

QUALITY ASSURANCE

In order to continuously improve the quality of the course we want you to:

1. After each powerpoint presentation are tasks. Please, answer to these tasks.
2. Report problems and proposals for improvements
3. Write a letter to the next participants
 - "What you should know for a successful participation"
4. Write a letter to the trainer
 - "What you should consider when giving the course next time"

INTRODUCTION

INTRODUCING THE PARTICIPANTS

SEARCH FORUMS

Go Advanced search (?)

After successful completing this e-learning course, participants will be capable of knowledge of hygienic design and microbial hazards in meat plant, hygiene control measures and open equipment in meat processing, cleaning and disinfection in meat industry. Thus, building design, zoning, walls, floors, electrical installation and GMP in meat plant are described in an e-learning course.

ONLINE USERS (last 10 minutes)

Sarune Zasytyte

Figure 2. The outline of the chapters in the e-learning course.

BUILDING DESIGN OF MEAT FACTORIES

Building Design

Tasks to be carried out:

- 5th slide shows an example of layout of a meat plant. What would you improve / change?
- May you try to create your own example of layout of meat plant?

Zoning

Task to be carried out:

- Please, write a definition of "zoning" term and it's importance on the general hygienic design terms.

Electrical Installation

Task to be carried out:

- What would you improve in the Figure below?

Walls

Task to be carried out:

- Walls made by metal panels have a problem with condensation (as it shows in Fig. below). What would you do to avoid this disadvantage?

Design of Floors


Task to be carried out:

Figure 3. Examples of presentations (pdf) and tasks.

EQUIPMENT USED IN MEAT INDUSTRY

 Open Equipment in Meat Processing

Task to be carried out:

 What would you improve in the Figure below?

CLEANING & DISINFECTION

 Cleaning & Disinfection

Task to be carried out:

 Please, write a cleaning and disinfection plan for a slaughterhouse

 Good Manufacturing Practise in Meat Plant


Task to be carried out:

 What would you improve in the Figure below?

Figure 4. Examples of presentations (pdf) and tasks.

ASSESSMENT

The achievement of the learning outcomes will be assessed by evaluating the assigned **tasks** and the **final exam**. The quiz for exam is not assessed but can be used to practice the final exam. It can be done **several times**. There are **multiple choice, true/ false, putting in a right order questions**. After practising with the quiz, the final exam can be done **only once**. The final grade is composed by **60% of the tasks and 40% of the final exam**.

 QUIZ for exam

 Final Exam

Figure 5. Example of assessment.

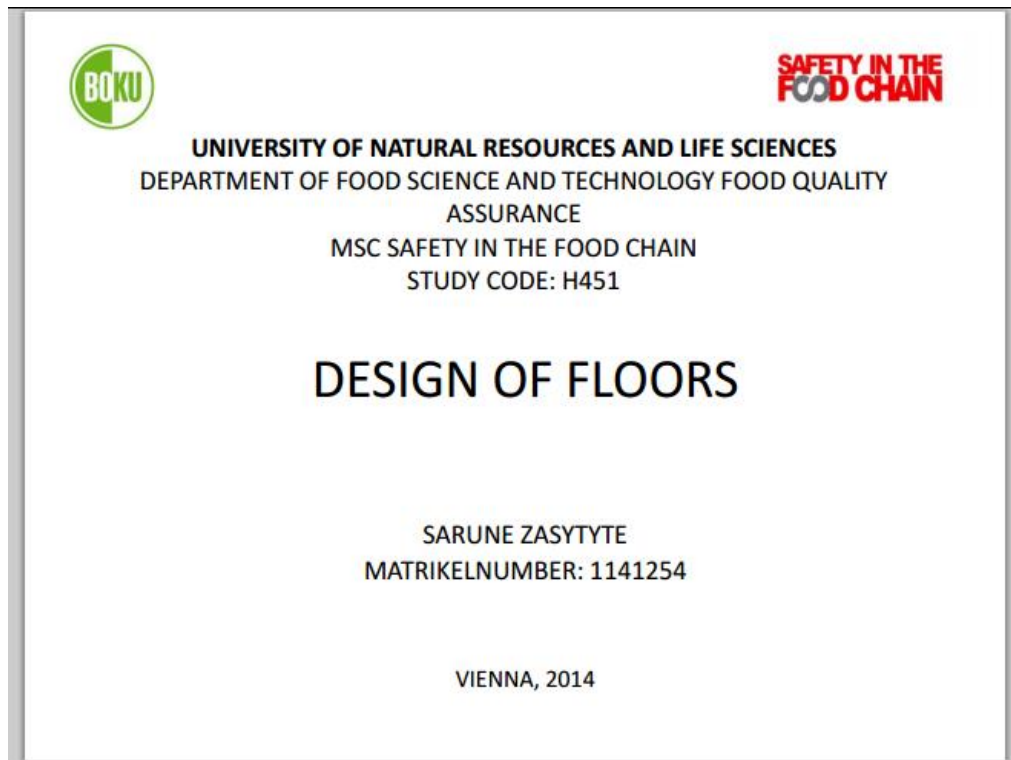


Figure 6. Example of self-study materials.

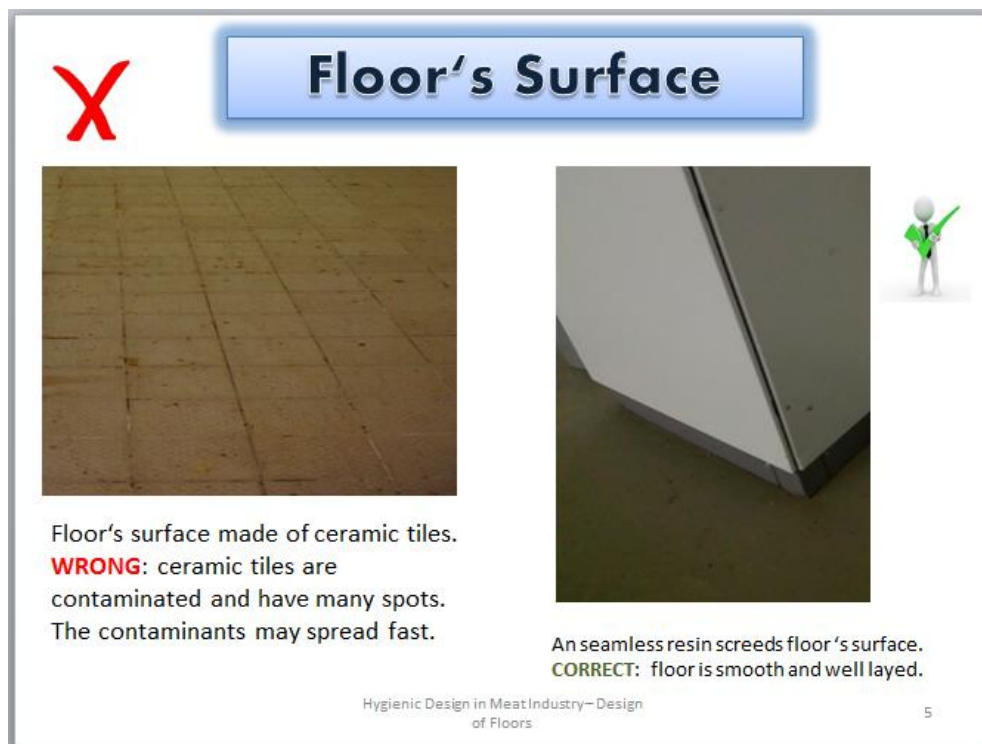


Figure 7. Example of self-study materials.



Figure 8. Example of self-study materials.



Figure 9. Example of self-study materials.

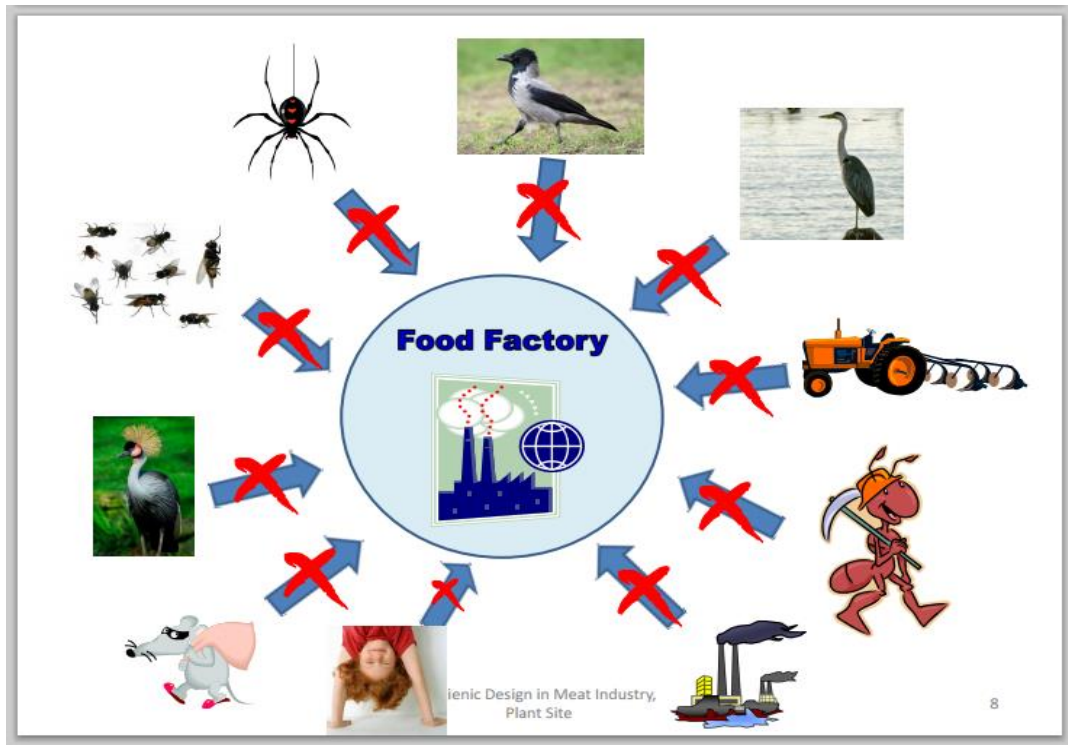


Figure 10. Example of self-study materials.

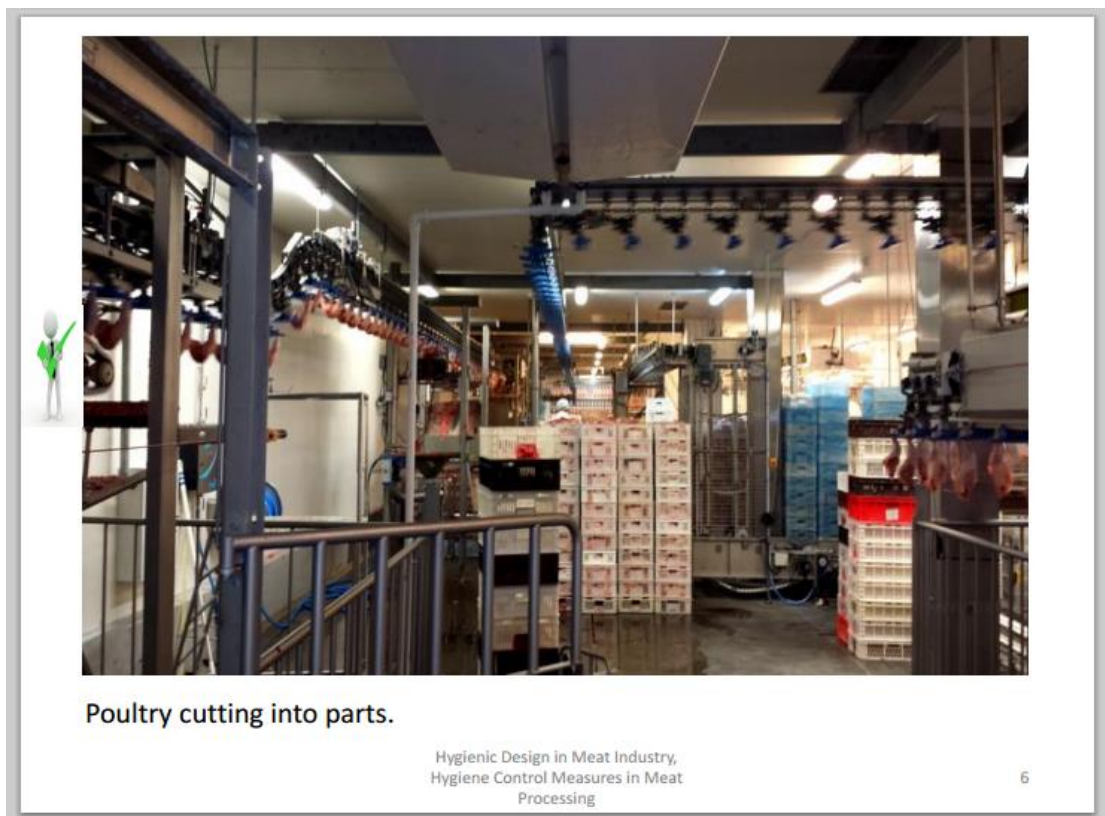


Figure 11. Example of self-study materials.

PLANT LAYOUT

Should be enough space in storage room.
WRONG: there is not enough space, unnecessary plastic are in the room. Thus, a ventilation-cooling system works not efficient -> too much ice on the ceiling.



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Figure 12. Example of self-study materials.

HIGH CARE AND HIGH RISK AREAS

- As small as possible.
- Packaging materials.
- Open meat processing.
- Storage rooms.
- Cooling areas, freezers.
- Employee behaviour, access points.
- Walls, drains, air filters.



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Figure 13. Example of self-study materials.



Figure 14. Example of self-study materials.



Figure 15. Example of self-study materials.



Figure 16. Example of an assignment: What is wrong in this picture?.

WHAT WOULD YOU IMPROVE IN THE FIGURE BELOW?



Figure 17. Example of an assignment.

| | |
|--|--|
| Question 5 Not yet answered Marked out of 1.0 Flag question Edit question | Which bacteria may cause a HUS (Hemolytic Uremic Syndrome)? Select one: <input type="radio"/> a. <i>Listeria monocytogenes</i> <input type="radio"/> b. <i>E. coli</i> O157:H7 <input type="radio"/> c. <i>Salmonella</i> spp. |
| Question 6 Not yet answered Marked out of 1.0 Flag question Edit question | Which sources fits to <i>Clostridium Perfringens</i> ? Select one: <input type="radio"/> a. Intestinal tract of humans and animals, sewage <input type="radio"/> b. Beef, dry-cured salami, raw milk, untreated water <input type="radio"/> c. Intestinal tract of humans, soil, non-potable water, unprocessed food |
| Question 7 Not yet answered Marked out of 1.0 Flag question Edit question | What kind of pathogens might contain raw meat? Answer: <input type="text"/> |
| Question 8 Not yet answered Marked out of 1.0 Flag question Edit question | Which materials are mostly used in equipment design? Select one: <input type="radio"/> a. Stainless steel, lead, elastomers, zinc, copper <input type="radio"/> b. Sealants, ceramics, elastomers, plastics, stainless steel <input type="radio"/> c. Plastics containing phenol and formaldehyde, stainless steel, bronze, ceramics, sealants |

Figure 18. Multiple choice and putting in a right order questions from the 'Quiz for Exam' part.

| | |
|--|---|
| Question 6 Not yet answered Marked out of 1.0 Flag question Edit question | Raised walkways over production areas can be used as a connection between two processing areas. Select one: <input type="radio"/> True <input type="radio"/> False |
| Question 7 Not yet answered Marked out of 1.0 Flag question Edit question | Surfaces of the equipments used in the meat processing should be free from cracks and crevices. Select one: <input type="radio"/> True <input type="radio"/> False |
| Question 8 Not yet answered Marked out of 1.0 Flag question Edit question | Which measures is NOT control measures to prevent the growth of microorganisms in meat industry: Select one: <input type="radio"/> a. Treatment of water supply <input type="radio"/> b. Transportation to market <input type="radio"/> c. Control of flies |
| Question 9 Not yet answered Marked out of 1.0 Flag question Edit question | What is recommended minimum safe internal temperature (°C) for pork: Select one: <input type="radio"/> a. 80 <input type="radio"/> b. 71 <input type="radio"/> c. 63 |

Figure 19. Multiple choice questions from the 'Final Exam' part.

5. EVALUATION

For the evaluation of the e-learning course some questions are asked to participants to get feedback on the usability of this course. An example of the evaluation from participants is given as followed.

Table 1. Example of one evaluation.

| | Criteria for evaluating e-learning course | | | | | |
|--|---|-----------|---------|--------------|-------------------|----------|
| | Very Satisfied | Satisfied | Neutral | Dissatisfied | Very dissatisfied | Comments |
| | Please mark the relevant column with X | | | | | |
| Use and Usability | | | | | | |
| Is the design of ISEKI platform attractive, clear (visual style, graphics) | x | | | | | |
| Can participants find information easily and write own comments/questions/opinion? | x | | | | | |
| Content related aspects | | | | | | |
| Content is suitable for target group | | x | | | | |
| Did the course meet with your expectations? | | x | | | | |
| Is the content sufficient? | x | | | | | |
| Are the details of the chapters are sufficient? | x | | | | | |
| Which topic may be added to the content? | I would add a topic: ‘How technologist should manage his training for other employees?’ | | | | | |
| Which topic may be removed from the content? | | | | | | No one. |
| The content of material is attractive | x | | | | | |
| The content is well structured and presented in a logical sequence | x | | | | | |
| The exercises relate to the content | x | | | | | |
| Are the learning materials easily understandable? | x | | | | | |
| The tasks are clear | x | | | | | |
| The quiz tests are understandable | x | | | | | |
| The writing style is clear | x | | | | | |
| The overall quality of the learning materials | x | | | | | |
| Can participants check | Yes | | | | | |

| | | | | | | |
|-------------------------------------|---|--|--|--|--|--|
| their grades? | | | | | | |
| Communication and Support | | | | | | |
| Availability of trainer support | x | | | | | |
| Possibility to communicate by forum | x | | | | | |
| Possibility to communicate by email | x | | | | | |
| Possibility to communicate by chat | x | | | | | |

Free comment: 'So far course is easily understandable. Sections are clearly divided. Questions after each lesson (slides) are both checking memory and understanding of the content as well as requiring to apply gained knowledge to deal real life industry issues'.

Regarding to the evaluations, the course met with the participants expectations. The content and slides are easily understood and the structure is easy to follow. The quiz will help to participants practice learning materials and the exam will show how sufficiently they learnt the topics. For the following details the course can be found at (<https://moodle.iseki-food.net/course/view.php?id=44>).

6. CONCLUSION

Three types of training materials are created on an international platform. There is a handbook, PowerPoint presentations and an e-learning course. The handbook may be printed and used among target groups. Presentations have established a flexible way of learning. Thus, they provide quick answers to the problems faced within the meat industry. After completing this e-learning course, participants will improve their knowledge of hygienic design. These presentations are used in the e-learning course for 'Hygienic Design in Meat Industry' in the ISEKI Food Association as training materials. The e-learning course is complemented by the handbook and presentations. PowerPoint presentations are used for self-training at any time.

The materials are structured, which makes self-studying easier. They may be changed according to needs of training. Available materials for learning, easy following instructions, sharing of personnel experience, discussion forums, possibility to update materials, self-evaluation of the course, retention of learning through personalized learning are effective methods to produce attractive learning.

7. REFERENCES

- [1] 3-A Sanitary Standards, Source: <http://www.3-a.org/>. Accessed by 5 June 2014: 14:49.
- [2] DANILČENKO H. *'Quality and Safe Management of Raw Food'*, Aleksandras Stulginsis Univeristy, 2012.
- [3] Education and Development Center, *'A professional course for educators creating, implementing, maintaining, and managing systems'*, (No. VP1-2.2-ŠMM-02-V-02-001).
- [4] European Committee of Standardization, Source: <http://www.cencenelec.eu/>. Accessed by 1 June 2014; 20:15.
- [5] European Hygienic Engineering & Design Group, Source: <http://www.ehedg.org/>. Accessed by 5 June 2014; 13:23.
- [6] Lithuanian Food Safety and Hygiene Norms HN 15:2001, *'Food Hygiene'*, 29 December 2001, No. 684, Vilnius.
- [7] Lithuanian Statistics, *'Review of Agriculture and Food State of January-March in 2013'*.
- [8] National Sanitation Foundation, Source: <http://www.nsf.org/>. Accessed by: 3 June 2014; 16:35.
- [9] Project funded by EU *'Employee Safety and Health'*, 2003. Source: <http://www.ueapme.com/business-support%20II/Training%20Tools/Confesercenti/LT-Health%20and%20safety%20at%20work.pdf>. Accessed by 8 June 2014; 11:49.
- [10] Report for European Council / COM/2013/0755 final / Source: eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0755:FIN:LT:HTML Accessed by 28 January 2014, 14:35.
- [11] Republic-Owned Enterprise, Agricultural Information and Rural Business Centre/ Source: www.vic.lt/?mid=595 Accessed by 28 January 2014, 14:59.

8. INTERNET REFERENCES

- 3-A Sanitary Standards, Source: <http://www.3-a.org/>. Accessed by 5 June 2014: 14:49.
- European Committee of Standardization, Source: <http://www.cencenelec.eu/>. Accessed by 1 June 2014; 20:15.
- European Hygienic Engineering & Design Group, Source: <http://www.ehedg.org/>. Accessed by 5 June 2014; 13:23.
- National Sanitation Foundation, Source: <http://www.nsf.org/>. Accessed by: 3 June 2014; 16:35.
- Project funded by EU '*Employee Safety and Health*', 2003. Source: <http://www.ueapme.com/business-support%20II/Training%20Tools/Confesercenti/LT-Health%20and%20safety%20at%20work.pdf>. Accessed by 8 June 2014; 11:49.
- Report for European Council / COM/2013/0755 final / Source: eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0755:FIN:LT:HTML Accessed by 28 January 2014, 14:35.
- Republic-Owned Enterprise, Agricultural Information and Rural Business Centre/ Source: www.vic.lt/?mid=595 Accessed by 28 January 2014, 14:59.

ANNEX I – Handbook of Hygienic Design in Meat Industry