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  - laba1.tex
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\documentclass[a4paper]{article}
\makeatletter
\newcommand*{\rom}[1]{\expandafter\@slowromancap\romannumeral#1@}
\makeatother
\usepackage{hyperref} %для гипперссылок
\usepackage{setspace} %межстрочный интервал
\usepackage{ragged2e} %выравнивание
\usepackage{fancyhdr} %заголовки
\usepackage{titlesec} %опять заголовки шрифты размеры тыры пыры
\usepackage{setspace} %временное изменение межстрочного интервала
\usepackage{newtxtext, newtxmath} %для таймс ню роман
\usepackage{microtype} %для лучшего типографического оформления
\usepackage{multicol} %для колонок
\usepackage[utf8]
```

Applied Aspects of Using OSTIS Technology in Information Support of Digitalisation of Water Use Processes of Dairy Processing Enterprises

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***Abstract*—The conceptual approaches of digitalisation of manufactures based on the e-Manufacturing ideology are evaluated, which are proposed to be used for modelling the processes of water use of milk processing enterprises; the organisational and technological processes of formation of pollutants in their wastewater are analysed. In IDEF0 methodology functional modelling of water use of such productions is carried out, that allowed to reveal complexity and multidirectionality of interrelations of parameters and to justify the use of OSTIS technology for tasks of formation of intellectual information and reference system. On the example of a biological pond as a node of wastewater treatment, an element of the proposed approach of practical implementation of OSTIS-solutions in the segments of digital modelling of the dairy industry and environmental management is implemented.**

***Keywords*—Digitalisation, water management, milk processing, information and reference system**

I. Introduction

The term Digitale Fabrik (digital factory) is used to describe production in the context of informatisation, but today the essence of Digitale Fabrik is more often expressed by the term e-Manufacturing. At the heart of the idea of e-Manufacturing is the continuous application of digital models in the design and operation of production systems. Not only the products themselves are modelled, but also production equipment, material flows, as well as production and logistics processes, taking ergonomics and human factors into account. The goal of e-Manufacturing is to achieve such a level of object and process modelling that the real manufacturing process starts only after all its elements have been studied and optimised with the help of models [1].

Digital manufacturing is one of the components of product lifecycle management (PLM) technology, its main technological processes in different industries can differ significantly, even enterprises of the same industry can have different technological processes. Such operations include the functioning of complexes ensuring the fulfilment of environmental requirements, including the removal (treatment, discharge) of industrial wastewater (WW) [4], [5].

This problem is especially acute for enterprises of milk processing industry.

II. Technological problems of formation and treatment of wastewater of milk processing enterprises

Contaminated wastewater of milk processing plants is a product formed after washing of equipment, technological piping system, transport tanks of different volumes, including road and railway tanks, flasks and other containers [6], [7]. Also the sources of pollutants formation include effluents after cleaning of production facilities, washing of panels and floors. The amount of polluted wastewater is 20% — 50% of the total volume of water use. Wastewaters of milk processing enterprises belong to the category of highly concentrated organic pollutants: they contain significant concentrations of organic pollutants (fat, protein, lactose), polluted also with inorganic compounds (including acids and alkalis) and synthetic surface active substances (detergents). Their composition and concentration of pollutants depend on the profile and productivity of enterprises [7], [8].

Analysis of literature sources [4]–[8] has shown that there is an intensive search for rational and highly efficient methods and technologies of wastewater treatment for food industry enterprises (including dairy industry). The most common solution in this area is the combination of classical treatment methods with new methods [8],