РЕЗЮМЕТА НА ПУБЛИКАЦИИТЕ
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27. **<u>*N. Vaklieva-Bancheva*</u>**, *B.Ivanov*, (1999), **Waste Minimization through Optimal Plant Retrofit**, Computers and Chemical Engineering, V. 23, S75-S78, ***ISSN:0098-1354***, (IF=2.235).

Abstract:

A problem for optimal plant retrofitting, aiming to minimize the acrylonitrile released in the atmosphere from a Gas Treatment Department at Acrylic Fibre Plant, is considered. The applied retrofit policy involves (i) substitution of a used solvent with an appropriate selected mixture; (ii) flowsheet superstructure definition; and (iii) process parameters and mixture composition determination, so as the environmental regulations at minimum total retrofit cost to be reached. The pointed steps are described and the results obtained are discussed.

28. *G. Marinov,* **<u>*N. Vaklieva-Bancheva*</u>**, *B. Ivanov, Chr. Boyadjiev, V. Nikolova,* (1999), **A program Package for Technological Process Simulation in Petroleum Terminals and Fuel and Oil Depots**, Bulgarian Chemistry and Industry, v.70, No4, pp.120-124.

Abstract

The main features of a program package HYSYSIM for technological processes simulation in petroleum terminals and fuel and oil depots are considered in this paper. The simulation approach for complex chemical systems is used. A five level hierarchical mathematical model is created, involving: functional element, linear hydraulic sector models, hydraulic line models, hydraulic system models, and petroleum terminal and fuel and oil depot models.

The structure of the program package HYSYSIM and the main problems that can be solved are described.

The brief description of used menus for user- computer interaction is also done.

The program package HYSYSIM is tested for a real petroleum terminal.

29. *Varbanov P., Boyadjiev Chr., Ivanov B.,* **<u>*Vaklieva-Bancheva N.,*</u>** (2000), **Optimal Retrofit of Heat Exchangers Networks (HEN) Using Heuristic**

Paths and Suprstructures, Bulgarian Chemical Communications, v.32 No3/4 pp.517-528, ***ISSN:0324-1130***, (IF=0.171).

Abstract
In the presented study a new methodology for optimal, heat exchange network (HEN) retrofit is proposed. It involves a two-stage procedure for a correct solution of the optimization problem. At the first stage an appropriate HEN retrofit superstructure is to be built by using the pinch analysis and heuristic paths construction, while at the second one the optimal set of retrofit modifications is obtained using mathematical programming. The advantage of the proposed methodology is demonstrated by using a real case study.

30. *N. Vaklieva-Bancheva, E. G. Shopova, B. Ivanov,* (2002), **Application of Fourier Transformation for Waste Minimization in Batch Plants. 1. Analysis of Production Recipes**, Hungarian Journal of Industrial Chemistry, Volume 30, pp. 199-206, ***ISSN:01330276,*** (IF=0.180).

Abstract
An alternative system-oriented approach for determining the environmental impact assessments is proposed in the present study. It is based on the application of Fourier transformation for presenting the discontinuous functions of waste-w mass rate as continuous ones. Using the Fourier transformation the respective environmental impact indices are presented as functions of time and environmental impact assessments for a given pollutant and entire plant are obtained.
The approach is used for environmental impact analysis of production recipes based on the example of curd processing. The optimal milkfat content is obtained so that the Global BOD generated in the process is minimal. The distribution of the environmental impact indices into production cycle is also presented.

31. *N. Vaklieva-Bancheva, E. G. Shopova, B. Ivanov,* (2003), **Application of Fourier Transformation for Waste Minimization in Batch Plants. 2. Process-Units Assignment**, Hungarian Journal of Industrial Chemistry, Volume 31, pp. 13-21, ***ISSN:01330276,*** (IF=0.180).

Abstract
The problem for determining the minimum environmental impact for compatible products manufacturing in multipurpose batch plants is considered in this study. It is based on the use of the Fourier transformation for mathematical descriptions of the waste emissions from routine sources appearing into the horizon cyclically - an approach which has been proposed in its first part. The problem takes into accounts both the used materials compositions and the constructed production routes. The formulated sets of constraints follow for feasibility and compatibility of the chosen production routes and justify the accomplishment of the production demands into the determined horizon. Global or Local Environmental Impact Assessments are used as the objective function.

An example concerning simultaneous manufacturing in a dairy of two types of curds is used to illustrate the considered problem. The aim is to determine the milkfat content in the skimmed milk used as a raw material for both products, and plant units assignment for the respective processing tasks, at which the BOD generated from the process is minimal for accomplishment of some production requirements in a given horizon. Both the BOD generated due to the amount and composition of the processed milk and the one due to inherent losses are taken into account in the formulated problem.

32. *E. Shopova, N. Vaklieva-Bancheva,* (2003), **Short-term Scheduling of Curds Processing for Environmental Impact Minimization**, Journal of the University of Chemical Technology and Metallurgy, XXXVIII, 3, 779-784.

Abstract
This study considers a short-term scheduling in curds processing for environmental impact minimization. The aim is to find the best trade off between production requirements and the environmental impact assessed by BOD "generated" in the whole batch plant. The problem is formulated as MINLP. The contribution of the inherent losses in GBOD is taken into account.

33. *N. Vaklieva-Bancheva, E. G. Shopova, B. Ivanov,* (2004), **Minimization of Wastes from batch plants for Compatible Manufacturing of Products**, Bulgarian Chemical Communications, Volume 36, No 4, pp 253-262, *ISSN: 0324-1130*.

Abstract
The batch plants bring about numerous complications concerning waste minimization problems due to discreetness of the production, existence of multiple production routes etc. The aim of this paper is to deal with the waste minimization problems in particular case of compatible and cyclic manufacturing of a group of products in multipurpose batch plant. The formulated optimization problem takes into account both, the composition of raw materials and the scheme of production routes. Sets of constraints control the feasibility and compatibility of the production routes and justify the accomplishment of production demands in the time perspective. Aiming to avoid the problem of discreetness, an approach developed earlier, based on the application of Fourier transformation, is extended to model the waste emission of plant. Global and Local Environmental Impact Assessments are proposed to be used as the objective functions.
An example, concerning simultaneous manufacturing of two types of curds in dairy, is used to illustrate the considered problem. The aim is to determine the milkfat content for both products and the equipment applied, in such a way to fulfill a given demand for a specified time interval at minimal biological oxygen demand (BOD) "generated" from the process. The BOD "generated" by inherent losses also is taken into account in the formulated problem.

34. *E. G. Shopova, **N. G. Vaklieva-Bancheva**,* **(**2006**), BASIC – A Genetical Algorithm for Engineering Problems Solution,** Computers and Chemical Engineering, v. 30, pp.1293-1309, ***ISSN:0098-1354,*** (IF=2.235).

Abstract

This paper introduces in details a genetic algorithm-called BASIC, which is designed to take advantage of well known genetic schemes so as to be able to deal with numerous optimization problems. BASIC GA follows all common steps of the genetic algorithms. It involves real representation schemes for both real and integer variables. Three biased selection schemes for reproduction; four for recombination and three for mutation are applied in it and a new selection scheme for replacement is approached.
BASIC GA can be easy adjusted to the concrete problems by fitting its global and local parameters. It provides an opportunity to the genetic operators to be extended with new schemes.
A range of various optimization problems has been solved to test its capability. To handle all sorts of constraints the static and dynamic penalty functions are used. The solutions obtained are commensurable with other genetic algorithms and solution techniques.

35. *R. Adonyi, E. Shopova, <u>N. Vaklieva-Bancheva</u>,* (2009), **Optimal Scheduling of a Dairy Manufactury**, Chem. Biochem Eng. Q., V. 23, 231-237, ***ISSN:0352-9568***, (IF=0.483).

Abstract

This paper deals with short-term scheduling of the dairy industry. Two different approaches are proposed for obtaining the minimal makespan schedules. According to the first, S-graph framework is proposed to find the optimal solution of the flow-shop scheduling problem. The problem is solved by applying the branch and bound technique. The second approach uses the integer programming formulation of the scheduling problem and BASIC genetic algorithm has been used to solve the optimization problem. Both approaches take into consideration volumes of units assigned to perform tasks, and respective size factors that affect the size of batches and their number must be produces to achieve production goals and thus on the schedules duration. Manufacturing of two type curds is used as a case study. The results obtained show that both approaches provide comparable solutions. Both approaches could be seen as a good alternative to project manager to find appropriate schedule of the dairy industry.

36. *<u>**Natasha Gr. Vaklieva-Bancheva**</u>, Elisaveta G. Kirilova*, **(**2010**), Cleaner manufacture of multipurpose batch chemical and biochemical plants. Scheduling and optimal choice of production recipes,** Journal of Cleaner Production, Volume 18, Issue 13, pp. 1300-1310, ***ISSN:0959-6526*** **,** (IF= 2.598).

Abstract

This study presents an approach for cleaner management of multipurpose batch chemical or biochemical plants. Given that manufacture of most of the products could be carried out in multiple ways depending on chosen production recipes, the scheduling framework is extended by involving the choice of appropriate production

recipes. Using as optimization criteria the Global or Local Environmental Impact Assessments defined in Minimum Environmental Impact Methodology, the mathematical formulation that results in multi-objective optimization problems is presented for a special class of schedules.

The approach is implemented on an example from dairy industry. Production of two types of curds by selection from two available recipes for each one of them is considered. The problem is translated to a single objective. Two most reliable solutions are obtained, which differ in chosen production recipes, milkfat content and units involved for tasks implementation. Comments on the impacts on the load of Biochemical Oxygen Demand at the end of each production cycle due to simultaneous curds manufacturing and contributions of individual dairy wastes in Global Biochemical Oxygen Demand are also provided.

37. *Natasha Gr. Vaklieva- Bancheva, E. G. Kirilova, Toshko K. Zhelev and Jaime Rojas-Hernandes*, (2010), **Modeling of Energy Integrated ATAD System,** Journal of International Scientific Publications: Materials, Methods & Technology, Volume 4, Part 1, Pages: 220-233,. *ISSN:1313-2539*.

Abstract

The idea for energy efficiency improvement in Autothermal Thermophilic Aerobic Digestion (ATAD) batch processes follows the observation that the fresh sludge load to bio-treatment reactors causes a thermal shock of microorganisms. This study focuses on opportunities for the thermal shock reduction in conventional ATAD systems through recovery of heat from the effluent stream, which can lead to substantial savings of time required for operating temperature recovery, less foaming and quicker bio-degradation. Mathematical model for energy integration of ATAD system using two heat storage tanks is proposed. Solution of formulated optimization problem gives a response for energy efficiency and thermal shock improvement in bioreactors.

38. *Natasha Gr. Vaklieva-Bancheva, Elisaveta G. Kirilova*, (2010), **Working frame for Environmental Benign Management of Multipurpose Batch Chemical and Biochemical Plants**, Asian Chemistry Letters, ANITA Publications, (A Non Profitable Publication), Volume 14, Number 2, (April-June), *ISSN: 0971-9822*.

Abstract

The aim of this paper is to propose a working frame of a systems-oriented approach for environmentaly benign management of multipurpose batch chemical and biochemical plants. It provides opportunity: (i) to find the minimal environmental impact of production recipes; (ii) to choose management policies of the production systems; and (iii) to manage the peaks released pollutants. Proposed working frame uses the Local and Global Environmental Impact Assessments as optimization criteria. It was implemented on examples from dairy industry.

39. *N. G. Vaklieva, A. Espuna, E.G. Shopova, B.B. Ivanov and L. Puigjaner,* (2005), **Multi-objective Optimization of Curds Manufacture**, book series

Computer Aided Chemical Engineering, 20 B, pp. 1183-1188, Elsevier, *ISBN13: 978-0-444-51987-0*.

Abstract

In this paper, an important profit/environmental impact trade-off problem in dairy is presented as a multi-objective optimization problem. A Genetic Algorithm (GA) is used to find the conditions leading to the best compromise between both objectives. Two cases, at different weighting coefficients are considered to illustrate an enhanced effect of the environmental impact on the multi-objective function.

40. *N. G. Vaklieva-Bancheva*, E. G. Shopova, A. Espuña, L. Puigjaner, (2006), **Product Portfolio Optimization for Dairy Industry,** International Mediterranean Modelling Multiconference**,** pp.101-110, Piera LogiSim, *ISBN: 84-690-0726-2*.

Abstract

This paper deals with the short-term planning problem of a dairy complex. In it, a new time based approach for assessing the product portfolio feasibility is proposed. It takes into account the multipurpose and batch characteristics of dairies and employs the time resource distribution over the processing nodes and products.

The deterministic MILP supply chain model involving the portfolio feasibility constraints is formulated for the short-term planning of the dairy complex. The model accounts for market demands and milk provisions from distribution centers. The total site profit is used as an objective function. A genetic algorithm is used as a solution technique.

Manufacturing and distribution of three products in the production environment comprising two dairies, two markets and two milk distribution enters is solved as a case study. Optimal product portfolio is found and all obtained results are discussed in detail.

41. *N. Vaklieva-Bancheva*, A. Espuña, E. Shopova, L. Puigjaner and B. Ivanov, (2007), **Multi-Objective Optimization of Dairy Supply Chain**, book series Computer Aided Chemical Engineering, 24, pp. 781-786, Elsevier, *ISBN 978-0-444-53157-5*.

Abstract

In this paper, an important profit/market demands/milk vendors' satisfaction trade-off problem in dairy supply chain is presented as a multi-objective optimization problem. The Pareto Frontier is generated to present the front of the optimal compromise. The obtained Pareto Frontier contour plot is proposed to support the planning managers for quick plant profit estimation in case of priorities changing in dairy supply chain.

42. *Zhelev, T., Vaklieva-Bancheva, N, D. Jamniczky-Kaszás*, (2008), **About Energy Efficiency Improvement of Auto-thermal Thermophilic Aerobic Digestion Processes**, book series Computer Aided Chemical Engineering, 25, Topic 6: CAPE and Society, 1-6, Elsevier, *ISBN: 978-0-444-53228-2*.

Abstract

The idea for energy efficiency improvement in autothermal thermophilic aerobic digestion processes follows the observation that the fresh sludge load to bio-treatment-reactors causes a thermal shock. The paper focuses on avoidance of this thermal shock through recovery of heat from the effluent stream, which can lead to substantial savings of time required for operating temperature recovery, less foaming and quicker bio-degradation. Formulated optimization task gives a good starting point in this new area and opens interesting prospective for future promising energy integration solutions.

43. *Toshko Zhelev, **Natasha Vaklieva-Bancheva**, Jaime Rojas-Hernandes, Tony Pembroke*, (2009), **"Smelly" Pinch**, book series on Computer Aided Chemical Engineering, Volume 27, Pages 933-938, Elsevier, ***ISBN: 978-0-444-53569-6***.

Abstract

This paper attempts to make one further step in energy efficiency improvement of wastewater treatment plants connecting it with environmental considerations, namely the suppression of unpleasant aromas. Solution of the optimum heat integration when the off-gas from reactors is considered as heat source together with the effluent heat is presented. Further, the thermal management is linked to absorption efficiency through the classical concept of simultaneous heat and mass transfer. The conceptual approach of heat integration applied through Pinch analysis is extended to consider the mass exchange through a combined operating composite and equilibrium curve plot allowing for adjustment of uncertain variables, such as streams target temperatures and stripping water flowrate. A case study from an autothermal anaerobic digesting plant (ATAD) in Ireland is presented and the future plans of this ongoing project are discussed.

В сборници на конференции, с редактор

54. *J. M. Laínez, C. Benqlilou, A. Espuña, B. Ivanov, **N. Vaklieva**, L. Puigjaner*, (2007), **Use of CAPE-OPEN standards in the coordinated optimization of plant production scheduling and supply chain planning**, 6th European Congress of Chemical Engineering, September 16-21, Copenhagen, Denmark, Norhaven Books, 2007, p. 539-540.

Abstract

Following different specific needs and research programs during last years, a considerable number of simulating packages and components for chemical engineering have been created. However, it has been accounted that these pieces of software are not straightforwardly suitable for integration with other complementary applications, which constitutes a basic need from the perspective of industrial use. Aiming to respond to this need, the CO-LaN (http://www.colan.org) laboratory was created in order to develop common standards (CAPE OPEN standards) which should allow transparent communication between different applications. On the other hand, although the historical trend in the management of single manufacturing sites has been driven by the integration of aggregate planning and detailed scheduling1, current Advanced Planning and Scheduling (APS) systems support the decision making process at specific levels and functions, so that the consideration of their co-operative supply chain network (SC) requires a revised perspective and complementary decision making structures. Furthermore, additional SC key considerations (e.g. environment,

finances, marketing), are not adequately covered or even disregarded by current approaches. Under such circumstances, CO standards for interfacing software components seem an adequate answer and proper strategy to propose a framework made up of a flexibly envelope of diverse applications to assess SC decisions at different hierarchical levels and functions. The structure proposed in this work is thus in consonance with the trend towards enterprise wide modeling (EWO) which aims to integrate all the functional decisions into a global model driven by an overall key performance measure.

55. *Jaime Rojas Hernández, Toshko Zhelev,* **Natasha Vaklieva Bancheva**, (2008), **Enhancing Energy Efficiency of Wastewater Treatment – Study of Autothermal Thermophilic Aerobic Digestion**, CHISA-2008.

Abstract
The present work seeks to improve the energy efficiency of the autothermal thermophilic aerobic digestion (ATAD). It focuses on the reduction of the so-called thermal shock (TSk) caused by daily feeding of the reactors. The main hypothesis of this study is that the reduction of the thermal shock can lead to a shortening of the hydraulic retention time (HRT), therefore improving the energy efficiency. The methodology used to reduce the thermal shock is based on a combined conceptual and mathematical approach. A heat integration model is combined with a dynamic reactor model in order to provide realistic results. The preliminary results of this work in progress are presented showing that it is possible to reduce the thermal shock by 46% (113%) during the winter season and by 40% (98%) during the summer season using two energy recovery schemes. The complex effect of the thermal shock reductions on the HRT and the energy efficiency of the process is still under investigation.

56. *Елисавета Кирилова,* **Наташа Ваклиева-Банчева**, (2010), **Системно-ориентиран подход за екологосъобразно управление на многоцелеви периодични химически и биохимически производства,** Лятна школа „Химични и биохимични технологии и опазване на околната среда", Бургас, България, 5-8 юли, **CD** с докладите на Лятната школа.

Abstract
В работата се предлага рамката на един системно ориентиран подход за екологосъобразно управление на многоцелеви периодични химически и биохимически заводи. Рамката обхваща три нива на обсъждане: 1) ниво производствени рецепти; 2)ниво избор на екологична политика; 3) ниво управление на пиковите въздействия. В качеството на оптимизационни критерии са използвани глобални и локални оценки за въздействие върху околната среда.

В „Новости" информационен бюлетин на БАН

57. **Н. Ваклиева-Банчева**, *Б. Иванов, Хр. Бояджиев,* (2004), **Технология подобряваща екологичните показатели на индустриална система в**

нефто-химическата промишленост, НОВОСТИ, месечен информационен бюлетин на БАН, брой 5, (*на български и на английски*).

58. *Б. Иванов,* <u>***Н. Ваклиева-Банчева***</u>*, Хр. Бояджиев*, (2004), **Софтуер за синтез, реновация и оптимално управление на многоцелеви химико-технологични системи с периодични процеси с намалени емисии на вредни вещества в околната среда**, НОВОСТИ, месечен информационен бюлетин на БАН, брой 6, (*на български и на английски*).

59. *Боян Иванов,* <u>***Наташа Ваклиева-Банчева***</u>*, Кирил Минчев, Елисавета Шопова, Хосе Мигел Лаинес, Луис Пуиджанер, Антонио Еспуня,* (2007), **SC-MOPP" интегриран софтуер за оптимално планиране и разписания на многоцелеви химически комплекси,** Новости – месечен информационен бюлетин на БАН, брой 12 (52), (*на български и на английски*).