

ОДЕСЬКА НАЦІОНАЛЬНА АКАДЕМІЯ
ХАРЧОВИХ ТЕХНОЛОГІЙ

ЗБІРНИК
НАУКОВИХ ПРАЦЬ
МОЛОДИХ УЧЕНИХ,
АСПІРАНТІВ ТА СТУДЕНТІВ



ОДЕСА
2017

ББК 36.81 + 36.82
УДК 663 / 664

Головний редактор, д-р техн. наук, професор
Заступник головного редактора, канд. техн. наук, доцент.
Відповідальний редактор, д-р техн. наук, професор

Б.В. Єгоров
Н.М. Поварова
Г.М. Станкевич

Редакційна колегія
доктори наук, професори:

Р.В. Амбарцумянц, А.Т. Безусов, С.В. Бельтюкова,
О.Г. Бурдо, Л.Г. Віннікова, О.І. Гапонюк,
О.К. Гладушняк, К.Г. Іоргачова, Л.В. Капрельяц,
М.Р. Мардар, В.І. Мілованов, В.В. Немченко,
Л.А. Осипова, О.І. Павлов, В.М. Плотніков,
І.І. Савенко, О.Є. Сергєєва, Л.М. Тележенко,
О.С. Тітлов, Н.А. Ткаченко, О.Б. Ткаченко,
Г.М. Хмельнюк, В.А. Хобін, Н.К. Черно
О.О. Коваленко, Г.В. Крусір, Д.О. Жигунов

доктори наук:

Одеська національна академія харчових технологій
Збірник наукових праць молодих учених, аспірантів та студентів
Міністерство освіти і науки України. – Одеса: 2017. – 357 с.

Збірник опубліковано за рішенням вченої ради від 04.07.2017 р., протокол № 17
За достовірність інформації відповідає автор публікації

РОЗДІЛ 3

**ХОЛОДИЛЬНА ТЕХНІКА ТА ТЕХНОЛОГІЯ.
ПРОЦЕСИ ТА АПАРАТИ ХАРЧОВИХ ТЕХНОЛОГІЙ**

cold stream of T_{20} , then at the vortex tube $dT < dT_0$ temperature of the cold stream is higher than $T_2 > T_{20}$. This regularity is expressed by

$$T_2 - T_{20} = T_1 \cdot m \cdot (d_{T0} - d_T) \cdot \left(1 - \varepsilon^{\frac{1-k}{k}} \right) \quad \text{Eq.(2)}$$

where ε – pressure ratio; k – adiabatic index; T_1 – initial gas temperature; m – empirical coefficient.

In the interval $d_T = 40 \dots 10$ mm scale factor of influence is $m = 0,005$ [1]. In the transition to the small vortex chamber $d_T = \rightarrow 4$ mm the value decreases to $m = 0,008$. Area of diameters $d_T < 3$ mm has not been studied, even for the "high temperature" of the vortex devices. Creation and research of similar devices for cryogenic temperatures is associated with a number of design and operational obstacles. Increasing demands for precision machining equipment, particularly in the manufacture of the nozzle of the cochlea (Fig. 1). To reduce the impact of border effects is required to provide a minimum surface roughness of the flow part. It is necessary to consider the impact of heat flows. To reduce the cross section of elements in contact with the cooled gas and less conductive materials are used.

Gas-dynamic cooling are less efficient than expanders are. However, in circumstances when there is overpressure, this disadvantage is offset by constructive and operational advantages of such devices. One possible area of application of vortex tubes is cryogenics.

By reducing the temperature, an effective separation of mixtures in phase separators is achieved. A particularly promising direction is the use of technologies for rare gases production, which already have pressure differences. In this case, the cooling of gas flow is provided without additional energy expenditures.

Scientific adviser – prof. Symonenko Yu.M.

References

1. Merkulov, A.P. Vortex effect and its application in engineering. – M.: Energiya, – 1977. – 343 p. (Rus.).
2. Arkharov, A.M., Bondarenko, V.L., Symonenko, Yu.M. Oscillatory and Vortex Devices and Their Use in Rare Gases Extraction. Proceedings of a 11th IIR International Conference on Cryogenics, Bratislava, Slovakia, 2010. – P. 180-182.

DEVELOPMENT AUTOMATION OF WAREHOUSE TRANSPORT

Ihnatiev S., postgraduate

Odessa National Academy of Food Technologies

Nowadays, humans guide nearly all vehicles. This creates a number of problems. It can briefly describe as the human factor. Let us limit the overall concept of «vehicle» and consider only transport in warehouses of break-bulk cargo.

Since e-commerce are developing, there is creation of appropriate locations for goods storage and transshipment. The largest retailers in the world, such as Alibaba group, Amazon and Ebay have many thousands of items in their warehouses. Ukraine has this kind of trading floor too. The biggest one of which is «Rozetka». On these locations, there is a huge amount of orders processing, building and loading every day. E-commerce has become very popular among the global community. It has created need for intermediaries, which would be involved in the delivery of goods from the store to the customer. Postal services are deal with this assignment. Their number has recently increased. «Nova Poshta», DHL Express, Intime,

Autolux, Delivery Auto are the most popular services in Ukraine.

It was only two examples of service providers, which use big warehouses for break-bulk cargo storage.

There are advanced warehouses management systems (WMS) and cloud services for processing application like as Microsoft Azure, IBM Cloud etc. Therefore, processing application issue is already solved.

Now, there is a problem of mass cargo movements in warehouses, as well as most of such vehicles are still guided by the man. It leads to the creation of automated control warehousing facilities and vehicles. It would enable perform the necessary actions instead of humans. Firstly, it will get rid of the human factor, which may occur due to errors in the orders building. The human factor could lead to vehicles collision and crash equipment. All of this leads to slow or stop the process and lost time at eliminating consequences. This results in losses for owner. Secondly, automating orders processing, building and loading would help reduce the time to perform these operations. It will improve the truckloads.

As part of the investigation, based on scientific research Mechatronics Robot laboratory of Odessa National Academy of Food Technologies (ONAFТ) is taken place the work to create a minimum viable prototype (MVP) of mobile cart for warehouses. It is equipped with an automated guided system to perform operations of movement cargo without human intervention. Self-propelled cart has a wheelbase equipped with electric motors and runs on batteries. There is a set of sensors and programmed controller for position and track guided.

We aim to develop an automated guide vehicle for break-bulk cargo warehouses with resistant to external disturbing factors.

Academic adviser – Ph.D. V. Yehorov

References

1. Kyrtoк O. Research and synthesis optimum systems of vehicle automatic driving: spec. 05.13.01 – An engineering cybernetics: the thesis for a Ph.D scientific degree, 1973.
2. Safa S. Models and automation equipment of administrative processes by mobile objects: spec. 05.13.07 – Automation of administrative processes: the thesis for a Ph.D scientific degree, 2009.

MODERNISATION OF THE PORTABLE ROBOT ROBOTINO TO IMPLEMENT THE SYSTEM OF AUTOMATIC CONTROL OF STORAGE FACILITIES

**Pohlebina N.A., 4th year student, faculty AM&R
Odessa National Academy of Food Technologies**

Mobile robot is a robot which can move independently and move in space. Share three classes of mobile robots: ground robots, air and sea. Portable and mobile robots are currently widely used in all fields of life. Each of these classes helps people in situations dangerous to life and makes life easier in routine work.

Increasingly, robots began to be used in industries and for tasks those are dangerous to human life. Portable Robotino robot for unloading, loading and layout of any items in warehouses. Its dimensions make it easy to pass narrow passages, and load capacity is 40 kg.

MINT DRYER CAPACITY OF 10 KG IN THE FINISHED PRODUCT PER HOUR Vashchenko Y.K.	53
DEPOLARIZING FIELD IN FERROELECTRIC POLYMERS AND ITS NEUTRALIZATION BY TRAPPED CHARGES Dzhakeli V.L.	54

**РОЗДІЛ 3 – ХОЛОДИЛЬНА ТЕХНІКА ТА ТЕХНОЛОГІЯ.
ПРОЦЕСИ ТА АПАРАТИ ХАРЧОВИХ ТЕХНОЛОГІЙ**

CRYOGENIC MAINTENANCE OF RARE GASES SEPARATION PROCESSES IN 68...78 K TEMPERATURE RANGES Pylypenko B.A.	57
АНАЛІЗ РОБОТИ ХОЛОДИЛЬНОЇ МАШИНИ МАЛИХ ОХОЛОДЖУВАЛЬНИХ ПРИМІЩЕНЬ З ВИСОКОЮ ТЕМПЕРАТУРОЮ ТА НИЗЬКОЮ ВОЛОГІСТЮ ПОВІТРЯ Вовненко В.С.	58
THE USING OF GAS-DYNAMIC COOLERS AT CRYOGENIC TEMPERATURES Tyshko D.P.	60
DEVELOPMENT AUTOMATION OF WAREHOUSE TRANSPORT Ihnatiev S.	62
MODERNISATION OF THE PORTABLE ROBOT ROBOTINO TO IMPLEMENT THE SYSTEM OF AUTOMATIC CONTROL OF STORAGE FACILITIES Pohlebina N.A.	63
РОЗРОБКА ПРОГРАМНОЇ ЧАСТИНИ СИСТЕМИ КЕРУВАННЯ ЕЛЕКТРОПРИВОДОМ Кадученко А.В.	65
СПОСОБ ТРАСПОРТИРОВКИ ТУШ ГОЛУБОГО ТУНЦА Ерема В.Ю.	67
ВДОСКОНАЛЕННЯ КОНСТРУКЦІЇ РОТОРНО- ПУЛЬСАЦІЙНОГО АПАРАТУ, ЩО ВІБРУЄ Налбат Д.Ю., Лебідь М.Р.	70
ПОКРАЩЕННЯ НАДІЙНОСТІ СТРУМИННОГО ГОМОГЕНІЗАТОРА МОЛОКА Пацький І.Ю.	72
USING OF IMPULSE ELECTROMAGNETICALLY FIELDS FOR LIQUID FOOD PRODUCTS BACTERICIDICAL TREATMENT Svyatnenko R.S.	74

**РОЗДІЛ 4 – СУЧАСНІ ТЕНДЕНЦІЇ В ТЕХНОЛОГІЇ ПИТНОЇ ВОДИ ТА
ПЕРЕРОБЦІ М'ЯСА, МОЛОКА Й МОРЕПРОДУКТІВ**

РОЗРОБКА ТЕХНОЛОГІЇ НАТУРАЛЬНИХ М'ЯСНИХ НАПІВФАБРИКАТІВ З КОМПЛЕКСНОЮ ДОБАВКОЮ «МАЛЬТОВИН» Журавльова К.Ю.	76
---	----

Наукове видання

**Збірник наукових праць
молодих учених, аспірантів
та студентів**

Головний редактор акад. Б.В. Єгоров
Заст. головного редактора, канд. техн. наук Н.М. Поварова
Відповідальний редактор акад. Г.М. Станкевич
Технічний редактор Т.Л. Дьяченко