

## APPLICATION OF INTEGRATED MARKETING IN DEVELOPMENT AND TECHNOLOGY TRANSFER IN UNIVERSITIES (CASE OF CHEMICAL INDUSTRY)

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The report is connected with main aspects of the marketing approach in the context of creating the integrated structures in universities and suggesting the main components of the marketing strategy of the technology transfer. For example, in relation to the pellet production technology authors have offered the organizational and economic grounds for improvement of its development and market promotion.

**Keywords:** marketing, technology transfer, innovation, granulator.

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The effectiveness of the innovation process is determined by the efficiency of its tool - technology transfer, namely the transfer of scientific and technical expertise, rendering scientific and technical services, application of industrial processes and product launches. These processes have special importance for universities, which, according to the well-known economist M. Finley, "should contribute to the prosperity and enrichment of the society, culture and economy. In their role as guardians, creators and disseminators of knowledge, universities contribute to the enrichment of people and the society they belong to. They should strive to direct their intellectual potential for the benefit of the society" [1].

The marketing aspect plays a special role, but currently in domestic universities it is used not very successfully or not used at all. It leads to the great losses of the country's resources. In order to confirm this it is enough to analyze the dynamics of the disappointing acquisition of patents and employment in the systems of technology transfer, the dynamics of revenues gained from commercialization of intellectual property and technology transfer statistics in budgetary institutions.

Thus, the aim of this work is to analyze the strategic aspects of integrated marketing of scientific research in universities and to consider them using a practical example of the line of granulators, developed in the Sumy State University (Sumy, Ukraine).

We offer to consider marketing in the field of research as a comprehensive

system allowing to link the existing (or potential) intellectual abilities with the needs of the society (environment). In modern conditions the integrated marketing goes to the forefront of technology development. It is implemented in the framework of Kline-Rosenberg model chain (chain-link model). Integrated marketing requires an entirely different approach to conducting research and development activities, to developing and implementing innovations. It is not the scientific thought that now determines the direction of development, but the change and development of consumer preferences, as well as anticipation of new demands and needs. Thus, there is a consideration of the various sources of innovation associated with information, knowledge and the market needs.

Among the main problems of implementation of the integrated marketing philosophy in innovation system of universities today the following can be indicated:

- problem of interaction between the university units (implementation of interdisciplinary projects), as well as between the units of the university and business (difficult to match the technology transfer process, delays in the negotiations, distrust of business in relation to universities, the lack of commitment to implement the business technology);

- lack of unique technologies and inadequate assessment of potential financial results, as well as the level of availability of access to university technologies due to their separate

development (there are such types of technologies as: available, requiring efforts to adapt, difficult to adapt, extremely difficult to adapt;

- lack of effective infrastructure needed for the technology transfer, insufficient funding, absence of the marketing approach. This aspect is reflected in the fact that the projects do not comply with the criteria of investment commercialization, namely the Pareto Law: only 20% of information give 80% of final result.

In order to solve these problems, one should carry out the evolutionary transition to the introduction of new management approaches and organizational forms of innovations. When drafting the development strategy of the university it is offered to use the following areas of integrated marketing:

- **Marketing foresight** - the development of high-tech projects based on scientific and technological potential to meet current market and technological trends. Foresight involves the project work with technology trends (add-pool studies and project ideas for the logical development of existing trends), search for inconsistencies in trends and integration of them into the project ideas [2].

- **Internal marketing** - when managing the implementation of scientific development and the competitive implementation of interdisciplinary projects involving various departments and laboratories of the university.

- **Cooperation marketing** - when promoting the cooperative preparedness and image of the university in the field

of creation of innovative chains and projects. In the context of globalization and transition from the post-industrial society of the developed world to the society based on knowledge, international cooperation of universities in scientific, technical and innovation sphere becomes especially important. The innovation process in the fifth R. Roswell model is not only cross-functional, but also multi-institutional and network-like. Thus, the marketing aspect is proposed as an instrument for shaping the innovation networks [3]. This development should be considered from the point of view of its members, if it is possible to use a focus group of consumers for detection of flaws in goods or services. The easiest way to do it is in the presence of an innovative network.

– **Intellectual Property Marketing**

– used to promote research results. In conditions when supply exceeds the demand for the scientific product, this marketing strategy must necessarily include legal protection in the respective regions - foreign patenting.

– **Consumer marketing** – used to promote the services and finished products. Implementation of prototypes limited by production capabilities of universities and delivery terms, as well as implementation of various plans and cooperation agreements can be used for the marketing purposes.

However, despite a number of difficulties, the innovation process in the university provides significant additional opportunities. When consumers are interested in a technology being developed and having no documents of title, an option agreement with the developers can be concluded concerning the copyright technology. An agreement should provide the expected results of development; participation of future licensee in the development; the possibility (and terms) to conclude a license agreement for priority testing of a technology; the formula to determine the price of the license; the developer's obligation to patent the innovation and convey an exclusive license to the licensee.

As a result, integrated marketing as a management tool facilitates the creation of high-tech research and entrepreneurial universities with efficient management

structure and international academic reputation, which can meet the world trends and respond to global changes flexibly. Notable examples of these are Oxford University, Harvard University, George Washington University etc.

We should consider the process of integrated marketing on the example of number of innovations related to granulators (patent № 29950 Ukraine, IPC (2006) V01J2 / 16; patent № 82754 Ukraine, IPC (2006) V01J2 / 16; patent № 90798 Ukraine IPC (2009) V01J2 / 16 V01J8 / 08 V01J8/18; patent № 99023 Ukraine IPC (2012.01) V01J2 / 16; application № a201403429, Ukraine; application № a201403428, Ukraine). Relevance of these technologies is defined by the fact that in the technology of production of mineral fertilizers and pore structure granules the granulation process is one of the main stages of the product formation (method of processing the raw material, in which some of its properties are changed and the homogeneous granules are formed in a spherical shape) followed by the stabilization structures (drying or cooling, can be simultaneous) and the allocation of marketable fractions. Not accidentally various schemes of fertilizer production are considered the granulator-type, as the granulator, excluding its main unit, forms the basis and the structure of production line.

In most cases, the granulation technology has now been defined, and the progress in this area is on the way of modernization of existing equipment towards the creation of more reliable structures, relatively simple to manufacture and operate. This equipment is characterized by long life cycle, so its purchase should be cost-effective. In order to be efficient, the units require correct operation, as well as high-quality and timely maintenance. Despite the existence of a large number of models of granulators, the principle of handling each type of them is simple. In relation to any piece of equipment used to make pellets we can make a list of specifications, which should be taken into account when choosing a device. The key performance indicators of granulation systems proposed include:

– *performance and dimensions;*

– *monodisperse granules*, i.e. uniformity of size;

– *reliability and simplicity of management*, i.e. the system has no complex electronic or other subsystems, being based on simple technical solutions;

– *durability*, i.e. the materials should be selected in a way ensuring maximum service life of more than 10 years;

– *versatility*, i.e. one granulator may be set to work with different performance levels and a wide range of products;

– *ecological purity*, i.e. the level of wastes accumulated during the granulation is minimized and the waste gases do not contaminate the environment.

The table 1 shows the analysis of main advantages of the granulators developed. It illustrates the evolution of technology and dynamics of creation of additional parameters of competitiveness. Note that the models 1, 2, 3 were designed as the improvement of existing counterparts, while models 4, 5, 6 have been developed to solve a specific problem (need). The greatest effect (technical and commercial) is provided by model 5. This confirms the hypothesis about the effectiveness of the integrated marketing.

In general, the estimated economic effect of application of the modernized granulation equipment (by reducing the product loss with dust and enhancing the monodispersity) is more than 300 thousand USD per year for the unit. In addition, the economic effect of reducing the environmental pollution goes up to 1 million UAH per year [4, 5].

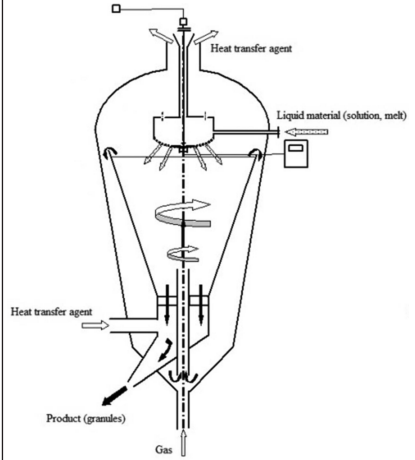
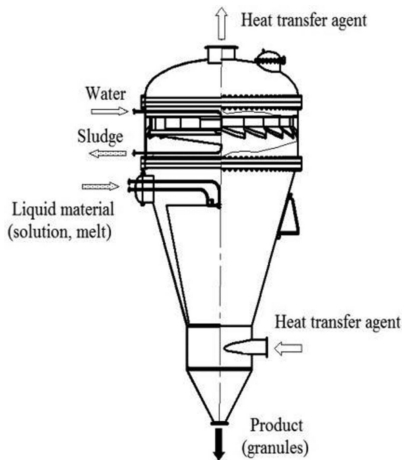
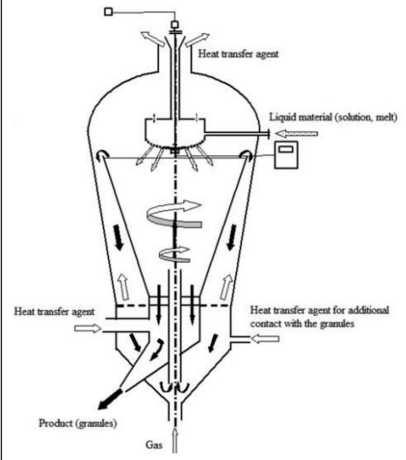
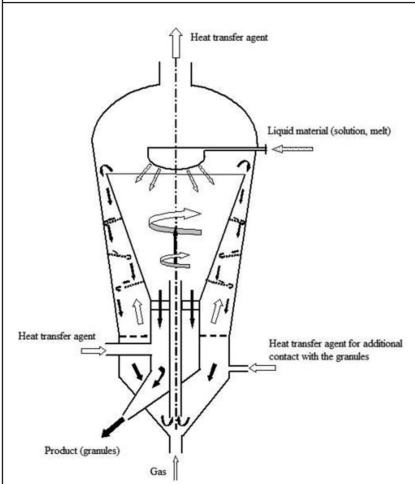
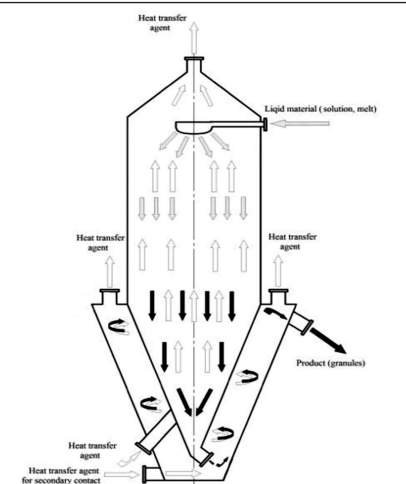
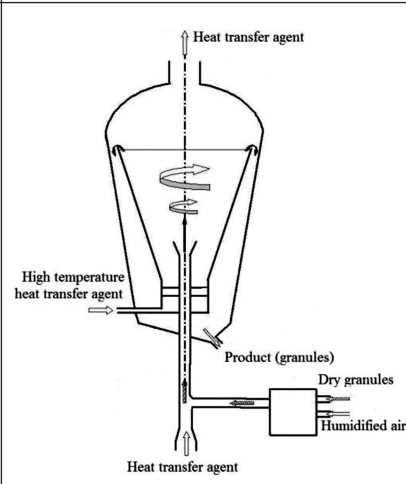
At the same time the feasibility of affiliate marketing model and marketing of intellectual property depends on the fact that the efficiency of warranty and after warranty period requires the university to ensure the necessity of the following labour-intensive work:

1) development of design and all kinds of calculations; selection and testing of materials; quality control at all stages of production; on the spot testing of granulators in all relevant modes of operation in the presence of the customer;

2) delivery and installation; field tests under the program, agreed with the customer; customer training – technology

Tab. 1

**Analysis of the granulator technology evolution**

1. Vortex granulator with vibrational spraying of melt	2. Vortex granulator with separation unit for the flue gas cleaning	3. Vortex granulator with two-stage contact of granules and coolant
Vibrational spraying of melt	Granulation in the vortex fluidized bed with purification of waste coolant	Increasing the contact time with the coolant flow
Reduction of pollution and the frequency of the atomizer cleaning by 3-5 times; reduction of the number of collisions between the melt drops by 2-3 times; reduction of the impact on the non-uniformity of a cut of a nebulizer's liquid material; improvement of the growth rate of the pellets to the product fractions.	Using the energy of the vortex gas flow from the working volume, energy utilization of waste heat, medium humidification in industrial premises.	Full completion of the crystallization process; preventing the formation of non-spherical granules; reduction of the level of mixing fine and marketable fractions; increasing the speed of grain growth in relation to marketable fractions; increasing the product's monodispersity degree.
		
4. Vortex granulator with multi-stage zone of secondary contact of granules and coolant	5. The two-zone vortex granulator	6. Vortex granulator producing porous pre-moistened and drying granules
The secondary contact between the fine granules and coolant	Granulation in the flow of coolant towards the different organization of movement	Pre-moistening and drying of granules
Production at a lower temperature (by increasing the time fine fraction granules spend in the annular cavity of the intercase) and the coolant flow rate (by reducing the free area of the annular cavity of the intercase), preserving the integrity of cores of granules	Reducing the dimensions of the equipment, reducing energy costs for carrying out the process, increasing the product's monodispersity degree.	Reducing the probability of contamination of the walls of the inner cone; prevention of the possibility of granules gluing due to moisture; absence of stagnant zones at the bottom of the working space of the device.
		

operation, assembling, disassembling, inspection;

3) maintenance work during the warranty and post-warranty period on request; supplying spare parts at the request of the reserve.

At the same time improving the granulator with respect to specific conditions of using has a major influence on the production line efficiency. However, modernization of units should not be one-sided and only aimed at the process intensification. It is also necessary to search for ways to change and optimize the technology in order to fully use advantages of the technology available (market pull).

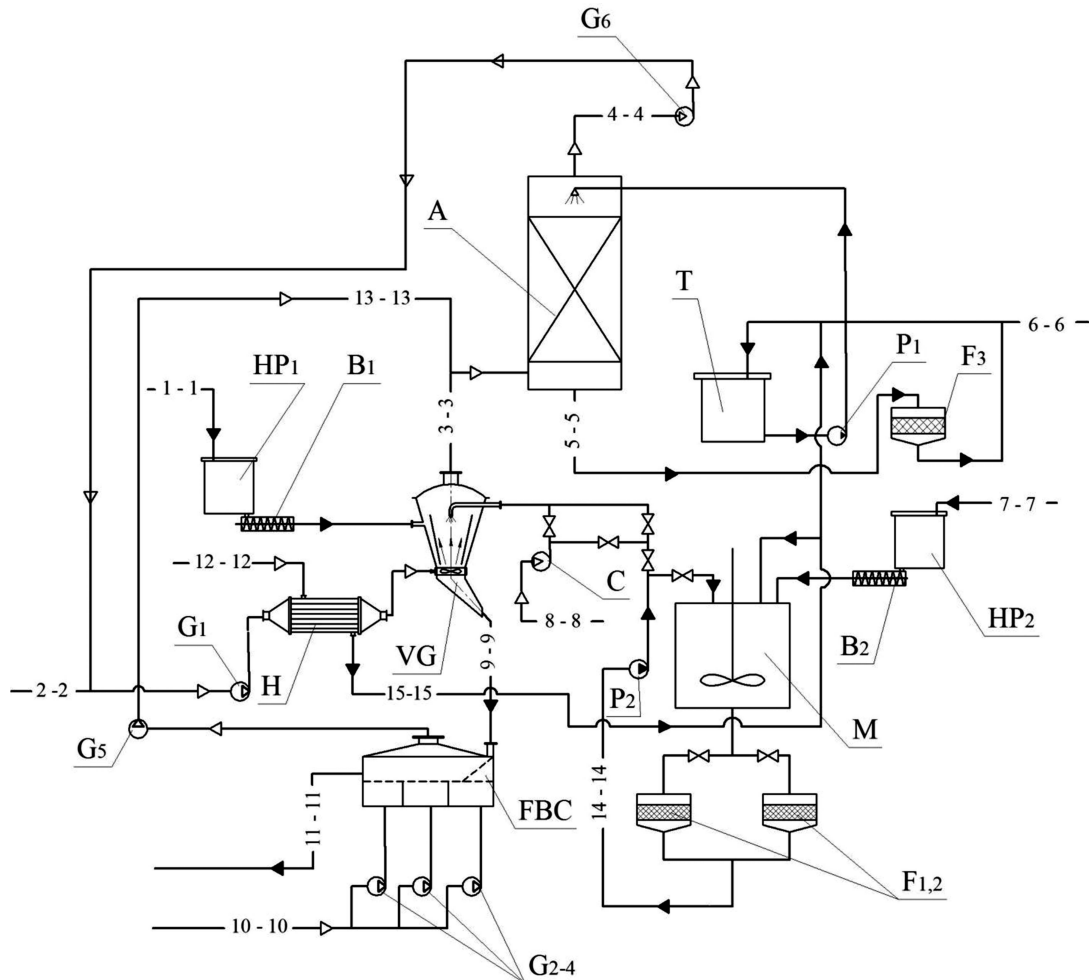
Therefore, we offer to consider the process of innovation development in

the framework of inter-technological link, which can be illustrated as a technological scheme of production of granules by using the vortex granulators developed (models 1-3 in Table 1) (Fig. 1).

From the Fig. 1 we can see that the variety of technologies are involved in the production (materials science, chemical engineering, heat and mass transfer technologies, automation etc.). These are incorporated into the technological package called "the granulator". Thus, we can apply the principle of creative symbiosis: the fusion of several technologies into one, simplifying the overall structure of the system, thereby eliminating or narrowing the limits of its evolution.

**Conclusion.** Thus, the development in a high-tech research university brings together various sectors in order to achieve integration and networking on the basis of a system and thereby implement the integrated model of the innovation process. The model is based on identification of needs and the subsequent product development, as well as the search for promising possible development of technologies and applications, search for the lost and forgotten technological and product ideas that can be effectively implemented.

In this case, marketing can ensure effective integration of advanced education and high technologies; the implementation of basic and applied scientific research on a global scale in



**Fig. 1. Scheme of granule production using the vortex granulator (author's innovation)**

**Elements of installation:** VG- vortex granulator; H - heater; FBC - fluidized bed cooler;

A - absorber; F - filter; M - mixer; B - batcher; HP - hopper; G - gas blower; P - pump; T - tank; C - compressor;

**Main flows:** 1-1 - retur; 2-2- manufacturing air; 3-3 - polluted air; 4-4 - purified air; 5-5 - polluted water;

6-6 - water; 7-7 - substandard granules; 8-8 - air for liquid material spraying (solution, melt); 9-9 - product;


10-10 - air for granules cooling; 11-11 - granules for packaging; 12-12 - steam; 13-13- dusty gas;

14-14 - liquid material (solution, melt); 15-15 - water condensate

a wide range of areas; the generation, application and dissemination of globally significant multidisciplinary polytechnic knowledge.

For example, in the paper it has been shown that in the development of granulators an integrated approach aimed at improvement of quality of fertilizers determines the trajectory of the following technologies: in production (reduction of harmful emissions and wastes, lowering the unit costs in the preparation of products; integrated automation of technological processes) and in improving the quality of products. Promising areas for further development are the expansion of licensing and the establishment of start-up companies.

#### References:


1. Finley M.I. The Ancient Economy. London: Darwin College, 1973. – 456 p.  <http://dx.doi.org/10.2307/4348254>
2. Razgljaev K., Han D. Forsajt i prognoz nauchno-tehnologicheskikh napravlenij dejatel'nosti vuza [Foresight and the forecast of scientific and technological activities of a higher education institution]. Kompleksnaja sistema razvitija nauchno-issledovatel'skih, opytно-konstruktorskih i tehnologicheskikh rabot v vuze [Complex system of development of research, experimental and technological works in a higher education institution]., Resursnyj sbornik. Programma «Jevrika». Fond «Novaja Evrazija» [Resource collection. „Eureka“ program. „New Eurasia“ foundation]. – Moskva, 2012. – pp. 33–44.

3. Krapyvny I.V. International innovation networks as new stage of innovation development [Internet source]., I.V. Krapyvny, V.A. Omelyanenko, N.O. Vernydub., Economic Processes Management: International Scientific E-Journal. – 2015., No. 1., Access mode: [http://epm.fem.sumdu.edu.ua/download/2015\\_1/2015\\_1\\_17.pdf](http://epm.fem.sumdu.edu.ua/download/2015_1/2015_1_17.pdf)

4. Sklabinskyi V., Artyukhov A., Kononenko N. Environmental aspects implementation of high-granulation equipment for the production of nitrogen fertilizers., International Journal of Sustainable Development. - 2013., Vol. 13., pp. 10-16.

5. Sklabinskyi V.I, Artyukhov A.E, Kononenko M.P, Rossi P.C. Quality improvement of granular nitrogen fertilizer in the prilling plants., CLICAP 2015: Congreso Latinoamericano de Ingeniería y Ciencias Aplicadas. – 2015., pp. 611-618.

#### Литература:

1. Finley M.I. The Ancient Economy. London: Darwin College, 1973. – 456 p.  <http://dx.doi.org/10.2307/4348254>
2. Разглаев К., Хан Д. Форсайт и прогноз научно-технологических направлений деятельности вуза. Комплексная система развития научно-исследовательских, опытно-конструкторских и технологических работ в вузе., Ресурсный сборник. Программа «Эврика». Фонд «Новая Евразия». – М., 2012. – С. 33–44.
3. Krapyvny I.V. International innovation networks as new stage of

innovation development [Internet source]., I.V. Krapyvny, V.A. Omelyanenko, N.O. Vernydub., Economic Processes Management: International Scientific E-Journal. – 2015., No. 1., Access mode: [http://epm.fem.sumdu.edu.ua/download/2015\\_1/2015\\_1\\_17.pdf](http://epm.fem.sumdu.edu.ua/download/2015_1/2015_1_17.pdf)

4. Sklabinskyi V., Artyukhov A., Kononenko N. Environmental aspects implementation of high-granulation equipment for the production of nitrogen fertilizers., International Journal of Sustainable Development. - 2013., Vol. 13., pp. 10-16.

5. Sklabinskyi V.I, Artyukhov A.E, Kononenko M.P, Rossi P.C. Quality improvement of granular nitrogen fertilizer in the prilling plants., CLICAP 2015: Congreso Latinoamericano de Ingeniería y Ciencias Aplicadas. – 2015., pp. 611-618.

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