

## IMPLEMENTATION OF INNOVATIONS UNDER CONDITIONS OF CHANGES IN THE OPERATION OF DOMESTIC ENTERPRISES

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The goal of the article lies in the study of the process of introduction of innovations under conditions of changes. Analysing, systemising and generalising results of scientific activity of a number of scientists, the article compares "innovations" and "changes" notions, determines their interconnection and differences and studies the innovation process using example of introduction of the rail fastening Pandrol Fastclip at Ukrainian enterprises as an innovation. In the result of the study the article focuses on the increasing value of conduct of active innovation activity at domestic enterprises. It justifies expediency of production and application of sleepers with innovation rail fastening Pandrol Fastclip, which is better than Ukrainian analogues by constructive and economic indicators, at Ukrainian rail roads. Prospects of further studies in this direction are search for possibilities of production of the studied fastening Pandrol Fastclip by Ukrainian enterprises and minimisation of negative aspects of transition to the innovation rail fastening in Ukraine.

**Key words:** innovations, innovation process, innovation changes, Pandrol Fastclip.

**Pic.:** 3. **Tabl.:** 2. **Bibl.:** 9.

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УДК 330.341.1

### Солоная Т. С., Гарафонова О. И. Внедрение инноваций в условиях осуществления изменений в деятельности отечественных предприятий

Цель статьи состоит в исследовании процесса внедрения инноваций в условиях осуществления изменений. Анализируя, систематизируя и обобщая результаты научной деятельности множества ученых, было проведено сравнение понятий «инновации» и «изменения», определены их взаимосвязь и различия, исследован инновационный процесс на примере внедрения рельсового скрепления Pandrol Fastclip как инновации на украинских предприятиях. В результате исследования было акцентировано внимание на возрастающем значении проведения активной инновационной деятельности на отечественных предприятиях. Обоснована целесообразность выпуска и применения на украинских железных дорогах шпал с инновационным рельсовым скреплением Pandrol Fastclip, которое выгодно отличается от украинских аналогов по конструктивным и экономическим показателям. Перспективами дальнейших исследований в данном направлении являются поиск возможностей производства исследованного скрепления Pandrol Fastclip украинскими предприятиями и минимизация негативных аспектов перехода на инновационное рельсовое скрепление в Украине.

**Ключевые слова:** инновации, инновационный процесс, инновационные изменения, Pandrol Fastclip.

**Рис.:** 3. **Табл.:** 2. **Библ.:** 9.

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### Солона Т. С., Гарафонова О. И. Упровадження інновацій в умовах здійснення змін у діяльності вітчизняних підприємств

Мета статті полягає у дослідженні процесу впровадження інновацій в умовах здійснення змін. Аналізуючи, систематизуючи та узагальнюючи результати наукової діяльності багатьох учених, було порівняно поняття «інновації» та «зміни», визначено їх взаємозв'язок і відмінності, досліджено інноваційний процес на прикладі впровадження рейкового скріплення Pandrol Fastclip як інновації на українських підприємствах. У результаті дослідження було акцентовано увагу на зростаючому значенні проведення активної інноваційної діяльності на вітчизняних підприємствах. Обґрунтовано доцільність випуску та застосування на українських залізничних шляхах шпал з інноваційним рейковим скріпленням Pandrol Fastclip, що позитивно відрізняється від українських аналогів за конструктивними та економічними показниками. Перспективами подальших досліджень у даному напрямі є пошук можливостей виробництва дослідженого скріплення Pandrol Fastclip українськими підприємствами та мінімізація негативних аспектів переходу на інноваційне рейкове скріплення в Україні.

**Ключові слова:** інновації, інноваційний процес, інноваційні зміни, Pandrol Fastclip.

**Рис.:** 3. **Табл.:** 2. **Бібл.:** 9.

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Nowadays everyone can observe the processes, currently taking place in Ukraine: high level of development of neighboring countries, significant need for rational and efficient use of all available resources and environment saving. All these facts once again prove that external economic environment is changing rapidly and requires corresponding changes in the internal environment of individual and business entities.

Against this background, innovative activity becomes a decisive factor in the survival and development of domestic enterprises. Innovations can be directed to improve all aspects of

the enterprise, starting from product innovations and finishing with management. However, implementation of innovations in these difficult conditions is complicated with the need of clear understanding of innovation processes and their efficiency appropriate validation.

Innovative activity is a key issue in the works of J. Schumpeter, C. Freeman, M. Porter, P. Druker, S. Hlavyeva, A. Horbunova, L. Martysheva, V. Aleksandrova, Y. Bazhal and many others. The problems of changes management in enterprises activity are actively discussed with particular attention by:

H. Rampersad, H. Tarasyuk, K. Levin, L. Hreyner and others. However, against the background of knowledge accumulation, it is a clearly apparent lack of innovation processes implementation in terms of changes in the enterprise activity, which has mainly practical meaning.

The purpose of the article is:

- ✦ theoretical and practical interconnection of the concepts of "innovation" and "change";
- ✦ determining theoretical aspects of the innovation in terms of the change;
- ✦ Practical substantiation of production and use expedience of concrete sleepers with rail fastening Pandrol Fastclip on the railways of Ukraine as innovation.

**Statement of the material.** Today innovation activity is a key factor in economic development of any country and any company. This statement directly applies to Ukraine, which still remains at an intermediate stage of development and requires rapid reorientation of manufacturing to the area of innovation and science-consuming industry.

At first it should be defined the key concepts, shown in this article, based on the Law of Ukraine "On the innovation activity".

**Innovation** – newly created (applied) and (or) improved competitive technologies, products or services, and organizational and technical solutions of industrial, administrative, commercial or otherwise, which significantly improves the structure and quality of production and (or) social services.

**Innovative activities** – activities which are aimed for application and commercialization of scientific research results and developments, and lead to the manufacturing and releasing of new competitive goods and services [1].

Objects of innovation activities may include innovative programs and projects, intellectual knowledge and products, manufacturing equipment and technological processes, industrial and business infrastructure, production, administrative and commercial decisions, products, resources, means of extracting and processing.

**Change** (in the organization) – a gradual transition of organization to the next level of development, by converting one or more of its elements.

The elements, which may be subject to changes, are structure, tasks, technologies, management processes, organizational culture, and staff.

One might have noticed that innovations and changes affect the same elements and processes in the organization, but between them, there is a significant difference. Let us look at this issue in terms of innovation activity, as the process (Fig. 1).

The scheme shows that the innovation process includes the preparation and implementation of innovative changes in several stages that form a single unit. The result will be the realized change - innovation. It should be emphasized that the innovation is not just some newly created product, approach or change, but the only one that significantly improves the efficiency of the operational system.

Nowadays, there are many theoretical approaches to the innovation process, and also practical examples of applying innovations at domestic enterprises. In this article, I want to explore the implementation of innovation products used in such area of industry, which is important for the development of any country – railway industry.

Railway rut is the main component of the railway track.

**Rail rut** – two rail threads, which laid from one to another at a defined distance, and are fixed to the sleepers (with rail fastening element).

Rail fasteners are one of the most important elements of a track structure, which has a significant impact on reliability, technical parameters of the rail track and the level of costs during the life cycle of railway track. Therefore, it is of first importance that particular attention to innovation in this area should be paid to. One of the most interesting in terms of research and practical application is an innovative track fastening type Pandrol Fastclip, that was developed in Great Britain.

First rail-sleeper grid with Pandrol Fastclip fastening was mounted in a rut in 1992. Over the elapsed period of time, rail fastening Pandrol Fastclip has been set to 397 railways in more than 110 countries around the world, stretching 330 000 km of track.

The comparative characteristics of innovation product and prestressed concrete sleepers with joints for rut fastening, classical for Ukrainian market are described in Table 1:

- ✦ clip-bolt (CB) fastening;
- ✦ intermediate spring (CIS-5) fastening;
- ✦ Pandrol Fastclip.

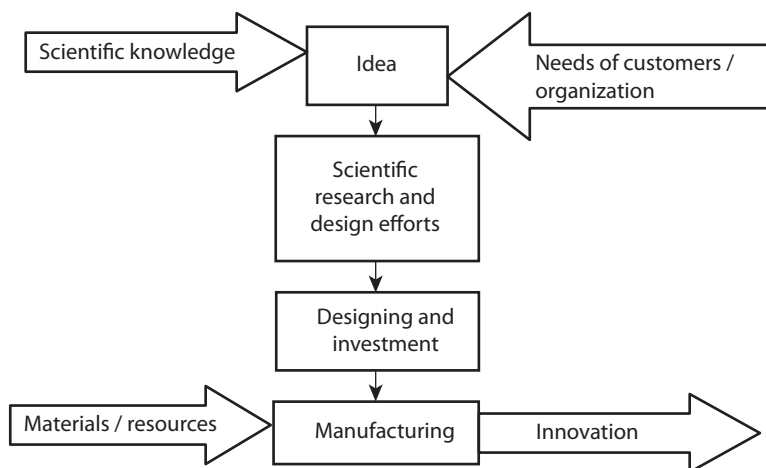


Fig. 1. Scheme of innovation process [9]

Table 1

Comparative characteristics of sleepers with rail fastenings CB, CIS-5 and Pandrol Fastclip

Characteristic	CB	CIS-5	Pandrol Fastclip
Manufacturer	Ukraine	Ukraine	Great Britain
Design characteristics	Separately-bolted type, lining, rigid	Anchoring, not-lining, elastic rod	Anchoring, not-lining, elastic rod
Destination	Typical intermediate separate clip-bolt rail fastening for concrete railway sleepers	Designed for placing on tangent and curved track sections with radius over 350 meters of joint-less railway lines with characteristics: – traffic volume up to 50 mln. tones gross-weight/km; – maximal speed up to 200 km/hour	For high-speed running on the main track lines: – without vehicle capacity limits; – maximal speed of passenger vehicles over 350 km/hour
Fastening elements	Lining layer Lining Resilient rail lining Clamping bolt Rigid clip Insert bolt Screw nut Double coil washer Insulating bushing Axial bead	Insert anchor "A3-2" Spring clip Rubber layer Shell	Anchor Clip and clamping insulator Elastic rubber layer Siding base insulator
Number of details in the fastening joint, pcs	21	7	7

Additional characteristics to design advantages of Pandrol Fastclip should also include:

- ✦ small number of components and their simplicity;
- ✦ anchor slip joint;
- ✦ electrical insulation;
- ✦ complete pre-assembly at factories producing reinforced concrete sleepers (sleepers are supplied to the assembly rail grid with all the components already assembled);
- ✦ mechanized power-positioned tool (modification of existing track-laying machines to install sleepers with fastening Pandrol Fastclip);
- ✦ Pandrol Fastclip fastening contributes to high durability of all elements of the path and the optimal operation conditions.

To substantiate the implementation of innovative rail fastening Pandrol Fastclip let's analyze a several number of economic indicators (Table 2).

With the help of comparative analysis, we can draw the following conclusions:

- ✦ CB fastening in all respects is inferior to fastenings CIS-5 and Pandrol Fastclip;
- ✦ fastenings CAT -5 and Pandrol Fastclip are very close and sometimes identical in many design parameters, but the fastening CAT -5 is supplied separately from the sleeper and requires additional costs due to the assembly of the rail grid and installation into the railway;
- ✦ Pandrol Fastclip fastening is economically more advantageous and profitable in comparison with all the studied parameters.

Having considered basic characteristics, design features, material capacity and prices of several types of rail fasteners, we have found that concrete prestressed sleepers with rail fastening Pandrol Fastclip are the best alternative which may be used today in Ukraine in such directions like:

- ✦ the construction of high-speed railways;

Table 2

Cost analysis for fastenings CB, CAT-5, Pandrol Fastclip

Indicator	CB	CIS-5	Pandrol Fastclip	Pandrol Fastclip in comparison with CB, %	Pandrol Fastclip in comparison with CIS-5, %
Price, UAH/pc					
– fastening	347	196	96	-261,5	-51
– sleeper with fastening	723	741	650	-10,1	-12,3
Statistical information:					
– material capacity, tones/km;	43	28	23	-46,5	-17,9
– rail-sleeper grid (RSG) assembly costs, %;	100	63	30	-70	-33
– labor capacity during assembly of RSG, %;	100	35	10	-90	-25
– operating and carrying costs, %/km	100	60	20	-80	-40

- ✦ Increasing the reliability of railway elements (reduced price and operating costs);
- ✦ Expanding the market (export ties to the EU and CIS).

Having proved economic expediency of the innovative rail fastening Pandrol Fastclip implementation, we should scrutinize on the organizational aspects of the described innovation and its process.

Currently, the cycle "manufacturer – installation of new railways" at domestic enterprises is carried out as shown on *fig. 2*.

*Fig. 2* shows that the fastening elements are supplied separately to company-manufacturer of concrete sleepers and MRS from multiple vendors, so it leads to increasing delivery periods, shortages, different quality of delivered goods, inaccuracies of geometrical parameters.

When implementing an innovative project on the use of rail fastening Pandrol Fastclip for high-speed lines, the cycle "manufacturer – installation of new railways" will be carried out as follows (*Fig. 3*).

When operating according to the suggested innovation scheme it is seen that:

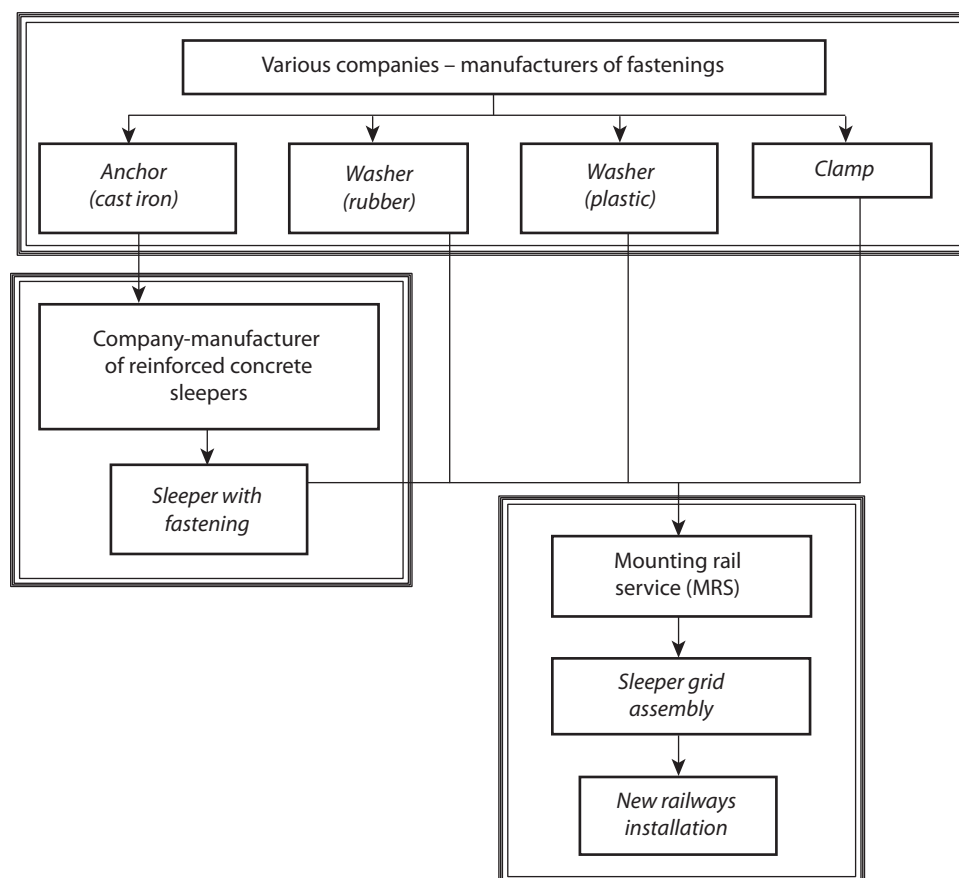
- ✦ Several providers of unit cells for rail fastening are combined into a single enterprise for manufacturing the fastening Pandrol Fastclip;
- ✦ Concrete sleepers come from the factory in a full pre-assembled condition (fastenings are mounted with the sleepers at manufacturer site and after that being completely assembled will be dispatched to PMS);
- ✦ High level of quality control of supplied products (accuracy of geometrical parameters and installation of a rail fastening is verified by the Ukrainian company-

manufacturer with special metrological instruments that eliminates the risk of mismatch for sleepers and rail fastening assembly at PMS and replacement of nonconforming elements).

Notably, an innovative fastening Pandrol Fastclip may be manufactured directly at domestic enterprises in case of coordination and signing contract with the company «Pandrol UK Limited» (Great Britain). This will help to reduce the cycle of "manufacturer – installation of new railways" by saving time and shipping costs delivering fastenings from Great Britain. For the modernization of enterprises on manufacturing concrete sleepers in Ukraine, certain cash assets and labor costs will be required. But taking into account, that the technology of prestressed concrete sleepers manufacturing is identical, the only difference is in the design of metal molds for rail fastening assembly and installation, a part of mold-forms can be used changing only the under-rail assembly site for fastening Pandrol Fastclip.

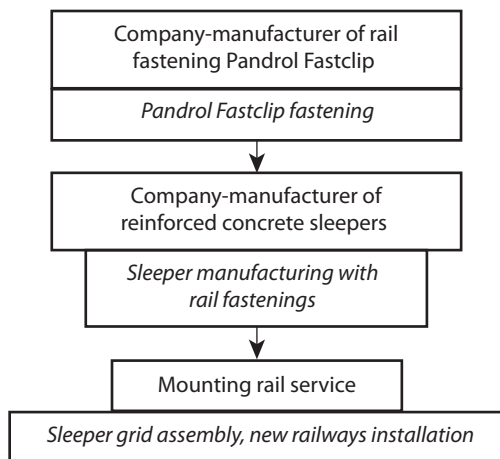
Using its own internal resources the domestic enterprise can produce an experimental volume of prestressed concrete sleepers with rail, and after bilateral agreement with the State Enterprise "Ukrzaliznytsia" can install manufactured experimental totally assembled product for operational tests into the existing railway.

On receipt of positive results and performance, Ukrainian enterprises can fully implement this innovative project on the application of rail fastening Pandrol Fastclip for high-speed lines that will provide access to the world market, the construction of high-speed ways for the modern rolling stock



**Fig. 2. Current scheme of the interrelation and products delivery**





**Fig. 3. Suggested innovation scheme "manufacturer – installation of new railways"**

in Ukraine and reduce operating costs for state enterprise "Ukrzaliznytsia".

### CONCLUSIONS

Innovation today is a decisive factor in the development of every country, every enterprise. This is especially true concerning domestic enterprises, since Ukraine has all necessary resources, both material and labor, that shows a high innovation capacity of our country. Implementation of possible innovations, under conditions of constant changes of external and internal environment at enterprises, allows to make exploitation of resources much more efficient, to enhance customer's satisfaction, and in general to enhance the competitiveness of organizations in the domestic and foreign markets. One of such innovations is a Pandrol Fastclip fastening, which implementation expediency at Ukrainian enterprises has been proved in this article. In comparison with domestic analogues, this fastening has better engineering, design and performance characteristics, and higher level of economic efficiency.

Perspectives for further research in this field is the detailed study of the production process of the rail fastening Pandrol Fastclip at Ukrainian enterprises, minimization of the costs of transition to an innovative rail track on the railways of our country. ■

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