

## ECONOMIC ANALYSIS OF INDUSTRIAL PROPERTY

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### ABSTRACT

*The intellectual property, viewed under both its components, industrial property, on the one hand, and copyright and related rights, on the other hand, is one of the basic levers of economic, social and cultural development of the nation. In this context, we can say that the protection of intellectual property is of great importance. Its essence, scope and purpose is to protect the product of human intelligence and at the same time, to ensure consumers that they can use this product.*

**KEYWORDS:** *intellectual property, industrial property, patent, analysis methods, evaluation methods, calculation methods, economic efficiency, financial efficiency*

**JEL CLASSIFICATION:** *O34, P14*

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### 1. INTRODUCTION

The intellectual property, viewed under both its components, industrial property, on the one hand, and copyright and related rights, on the other hand, is one of the basic levers of economic, social and cultural development of the nation (Jacob, 1995).

In this context, we can say that the protection of intellectual property is of great importance. Its essence, scope and purpose is to protect the product of human intelligence and at the same time, to ensure consumers that they can use this product.

Industrial property includes, among others, inventions, trademarks, industrial designs, new plant varieties, geographical indications, topographies of integrated circuits.

Assessment of intellectual property assets can be accomplished in several ways, by analogy with material goods. In this respect, the value can be determined by various methods.

Without going into technical details of assessment methods of industrial property, we will further present as a case study (application) the patent evaluation of D. Eng. Ion Șt. Basgan.

### 2. LEGAL FRAMEWORK FOR THE ANALYSIS OF INDUSTRIAL PROPERTY

Not long ago (23 October 2008) was promulgated the Decree Law for the completion of the Government Emergency Ordinance no. 100/2005 on assurance the compliance with industrial property rights (Official Gazette of Romania, Part I, no. 729/10.28.2008).

This draft law has appeared due to the necessity of regulation of some industrial property right problems protected by the Romanian state by granting a patent held by owners in the period after 03.06.1945 and to the present.

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By the Treaty of Peace between the Romania and Allied and Associated Powers signed in Paris on 02.10.1947 and ratified by Romania with the Law no. 304/08.30 1947 published in the Official Gazette. No. 199/1947, states that the period between the outbreak of the Second World War and the end of the eighteen month from the entry into force of the Treaty (see Annex 4) will be considered as an automatic extension of the validity period of industrial property rights.

However, in the same period was suspended also all the prescription or limitation periods of the right to bring or continue a legal action.

It is well known that the Communist regime in Romania after 03.06.1945 flagrantly violated the human rights and freedoms, including those concerning the patrimonial rights that corresponded to the inventor for his invention patent (Nastase, 2010).

Among the restrictive measures imposed to the authors by the inventions it is noted that by imposing the mandatory cession to the Romanian State (no.62/1974 law) or by other abusive means of exploitation by this of some inventions without the consent of the legal patent owner or of their successors in rights, the communist regime in Romania has violated the international provisions concerning the exclusive right of the patent owner over the patented invention and the principle of equal treatment of all holders of patent stipulated in Paris Convention on the industrial property from 03/20/1883 (Article 2), reviewed in Brussels in 1902, Washington in 1911, The Hague in 1925, London in 1934, Lisbon in 1958, to which Romania joined first time by the Law of 07.09.1924 and RPR joined by the Decree no. 427/1963.

### **3. INDUSTRY PROPERTY RIGHTS IN OIL DRILLING**

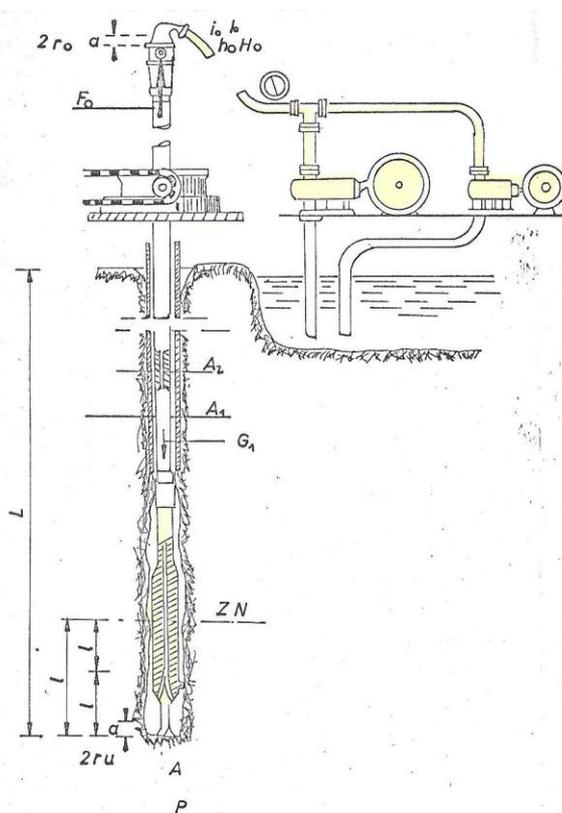
Worldwide and in Romania, in the year 1934, the drilling is performed using drilling rigs equipped with a pyramidal wooden tower within which were mounted the maneuver equipment (crane system geambla - carling winch and cable drilling, rotary table and other drilling gripper and other devices necessary for maneuvering - raising and lowering the drill string made up of steel drill pipe (pipe rolled in steel, a weight concentrated above the drill bit) and drill bit or two blades drill, as well as for the performance of other probe options.

The mechanical rotation system of the drill string and ultimately of the drilling and maneuver device (drill) was operated from the surface by a number of steam engines. In parallel with the mechanical rotation of the drill bit, for the purpose of its deep penetration up to the geological layers in which was found oil and / or gas, was used and is used a hydraulic circuit of the fluid (drilling mud) formed of the surface reservoirs (pits, ponds dug from the surface to which the material resulting from excavation was deposited on the edges after a certain geometry, pits in which is stored the drilling fluid in circulation, forging reserve mud and the debris being the material deployed in depth by the drill bit); the mud pumps that aspired the mud from the pit and conveyed it through a pipe system mounted on the surface inside the drill string (inside drill pipes) through the holes the screed holes in the probe soles from where was retrieved the material deployed by the hoe and it was carried through the annular space between the drill pipe and field / column of cased and cemented pipes to the catch pits from the surface, where the circuit was resumed. The basic elements in drilling performance are the speed drill (cutting) and the quality of the hole.

The main disadvantage of drilling technology used at that time referred primarily to the composition of the shaft drilling which did not allow to obtain vertical and uniform drill holes (cylindrical) (resulting large deviations from vertical place in different directions leading to the formation of numerous thresholds along the path of borehole - thresholds that complicate operations into the well, causing numerous technical accidents with the destruction of well equipment so that the drilling at depths greater than 2000 m was not practically possible. Moreover, the duration of a drilling well was big enough.

The innovations brought by the Patent no. 22789, author D. Eng Ion Șt. Basgan granted by Royal Decree no. 1579 of 05/15/1934, patent granted also in U.S. after three years of experimentation, under no. 21033137 of 12/21/1937, claimed by the author and confirmed by the mentioned patents represent the substantiation of results of some researches, practical observations and experiments conducted by the author in the oil sites in Austria and Romania and supplemented with those provided in the patents granted in 1937 and in 1947.

In figure 1 is shown graphically the shaft drilling composition according to the claims in the patent, with yellow being indicated new introduced parts, namely heavy proportioned pipes, a new circuit and a new pump, including the manometer that were included in the circuit drilling fluid which circulates through the inside of pipe drill.



**Figure 1. The shaft drilling according to the claims of patent no. 22789, granted by Royal Decree no. 1579 of 05.15.1934**

After preliminary experimentation, both in Romania and the United States since 1938 in practice oil and gas drillings was generalized the method to construct the bottom of the shaft drilling from drill-colare (heavy pipes with the diameter and the thickness of the top wall of the usual drill pipes) in length, weight and diameter, calculated in advance according to the above-mentioned patents.

Following the provisions of this patent could be achieved the digging of some vertical wells and the achievement of some drilling depths, that was unthinkable at the patent registration date (e.g. 7000 Băicoi well, the deepest in Romania, drilled to a depth of 7006 meters).

The invention has removed all deficiencies due to previous technologies applied and allowed:

- investigation of the geological formations at depths greater than 2000-2500 m, allowing the exploitation of some deposits of crude oil and / or gas below this depth which has important social connotations;
- time savings by increasing the drilling speed and lower costs for drilling wells under Basgan patents.

The Patent claims mentioned above are considered news in in the field of well drilling technique for the year 1934, respectively 1945 and which brought changes in the composition of shaft drilling, in manufacturing the component parts. It was also made and used a new product and patented process in well drilling.

The superiority of the method proposed by the patent of PhD Ion Șt. Basgan also by making savings during excavation time and therefore significant reductions in the cost of drilling in proportion of 33.8% - 28.2%.

In addition to these savings has been accomplished also a borehole, perfect vertical by employing the proportioned drill collars that have both their diameter and their length much larger resulting in a straight hole, i.e. without corners and vertical.

Since 1938 and until now, all oil companies in Romania have dug wells in accordance with the provisions of the Patent no. 22789, enhanced by the improvements.

After careful analysis of the design of wells 112, 113, 114, 115 Ocna Mureș, at depths of 1100m was anticipated the introduction into shaft drilling of the drill collars with a diameter of 6.5 / 8 inches in length from 80 - 85m, weighing 16 - 17 tons achieving a final maximum deviation also on the wellbore path less than 30 minutes.

In the period of protected validity of the patents, it can be deduced in this way that patents in this case were improperly exploited by the systematic infringement without the consent of the author.

Firms in the oil and gas industry that used the patented method of D. Eng Basgan Șt. Ion and the meters drilled by them, which were summarized by year, are taken from the Romanian Petroleum Gazette no. 9, 1942, pp. 266-270 and from the journal "Oil and Gas" 1958, No. 8, pp. 322-329. In the period of protected validity of the patents there is a reference point, ie the nationalization act from the date of June 11, 1948. By its provisions the oil and gas companies that have worked before and after the time of nationalization have passed into the ownership of Romanian state being managed by the Ministry of Finance (no matter what name they took over time), by the Ministry of Mines and Petroleum and its right successors, today the Ministry of Economy, under which functioned the economic operators (businesses, corporations, central, trusts, etc.), the successor of these being currently "S.C. PETROM S.A."

Compared to the total meters drilled by exploiting the mentioned patents, it was established the economic contribution brought and the rights to which are entitled the family descendants of D. Eng. Șt Basgan Ion due to the exploitation of patents.

#### **4. ECONOMIC ANALYSIS OF INDUSTRIAL PROPERTY RIGHTS IN OIL DRILLING**

Based on existing documents regarding the start date of Basgan Patent 22789 application, registered in Romania on 05/15/1934 (The patent) and in United States of America registered on 12/21/1937 under number 2103137, it is found that in Romania the patent was experimented during 1934-1936, and its application was generalized in 1937. The wells for comparison dug in 1937/1938 presented in the article of the engineer V. Petrescu Livadea (quoted above) and having as objective the assessment of economic effects of patent showed that:

- When using the proportioned drill collars in accordance with the patent of Basgan, at well no. 471 Cr.M. in the 89 perimeter Ghirdoveni-Tuicani of Mining Credit Company, at a depth of 1915 compared with the well 321 RA (same structure oilfields, situated at a distance of less than 600m, of well 471), drilled by Romanian-American Society, in 1937, according to existing procedures at the time (outside the provisions of the patent of Basgan) has been obtained an increase in the average speed of achieving the drilling by 33.8 percent, superior to that of the well 321R.A.
- Similarly, at well 450 Cr. M, dug in 1937 compared with the same well (450 RA) has made some progress in increasing the average speed drill with 28.2%, besides other advantages related to quality wellbore ("perfectly vertical hole," "right - ie no corners "). So finally Eng

V. Petrescu Livadea concludes: "The 30% progress achieved in speed and quality of drilling are welcome today, when we are ready to begin exploration campaign in the new oil lands".

- From 1934 until 1937 about 50% of drilling conducted in Romania was performed under Basgan Patent and since 1938, patented drilling method was widespread and all wells have been drilled in accordance with the provisions of the Patent Basgan.

Given the expertise on the presentation of a point of view on the validity of patents whose author is D. Eng. Basgan St Ion, results that first period of exploitation of Patent starts with registration date (05.15.1934) and lasts until the outbreak of World War II (September 1, 1939), respectively a duration of 5 years 3 months and 13 days of the patent protection period offered by the Patent of 15 years.

Period September 1, 1939 and March 1, 1949, in accordance with Law 304/1947 through which has been ratified the Peace Treaty between Romania and the Allies, do not take into calculation of the exploitation period of the patent, so that the lifetime of the patent to 15 years is extended until 17 November 1958, and if we take into consideration the improvement Patent No. 37743, with the filing date 16.01.1945, granted by Royal Decree 77847 of 01.30.1947, the 10-year protection period offered by the Patent starts to run, also from March 1, 1949, shows that the life of exploitation of this patent is until March 1, 1959.

In the validity period, according to statistics and data from existing literature, we present in table 1 and 2 the evolution of the drilled meters in Romania and evaluation of drilling volume achieved under patent Basgan.

**Table 1 First period of validity of the patent 05.05.1934-09.01.1939**

Year	Drill Meters	Drill Meters for Basgan's patent	Comments
1934	376930		The exploitation of the patent started
1935	312500		
1936	329000		
1937	394500	197250	It has been estimated the application to ½ of the wells drilled
1938	288000	288000	The exploitation becomes generalized
1939	256000	256000	

Source: Monitorul Petrolului Român, Nr. 9/1942, p. 266-270

Between 09.01.1939 and 03.01.1949 was suspended the validity period of industrial property rights and was extended accordingly until the expiration of the period of validity of the patent of 15 years and respectively 10 years.

**Table 2 Second period of validity of the patent 03.01.1941-03.01.1959**

Year	Drill Meters	Drill Meters for Basgan's patent	Comments
1949	517000	517000	From 03.01.1949
1950	657000	657000	
1951	826000	826000	
1952	980000	980000	
1953	933517	933517	
1954	808343	808343	
1955	863354	863354	
1956	897399	897399	

Year	Drill Meters	Drill Meters for Basgan's patent	Comments
1957	876600	876600	
1958	865000	865000	Until 17.11.1958
1959	935.500	77000	Until 01.03.1959
Total	11116.643	9042463	

Source: Petrol și Gaze, Nr. 8/1958, p. 322-329. The period that is analysed is 1949-1959.

From the above tables results that in the validity periods of Basgan patents were drilled 9042463 m using the technology from patents.

The data provided by the SC PETROSTAR Ploiești - the only Institute in Romania specialized in the research and design of drilling and exploitation of wells etc. results the following indicators of costs in function of the depth increments in 2008 (table 3).

**Table 3 Indicators of costs over increments of depth in 2008**

The depth of well [m]	Well's period of realization [hours]	Unit costs [lei/m drilling]
600	258	3967
700	363	3644
800	395	3865
1000	464	3525
1950	791	3416
2400	1022	3930
3000	1497	4185

Calculating the cost/meter drilled as weighted average in function of the depth increments results that this is of:

$$\frac{3967 \times 600 + 3644 \times 700 + 3865 \times 800 + 3525 \times 1000 + 3416 \times 1950 + 3930 \times 2400 + 4185 \times 3000}{600 + 700 + 800 + 1000 + 1950 + 2400 + 3000} = \frac{40196200}{11450} = 3486.53 \text{ lei/m}$$

We know the meters drilled by the patented process and the cost per meter drilled, so to determine the property rights it is necessary to establish which is the economic contribution, respectively the economic and social effects, resulted from the exploitation of patents, highlighting the criteria for assessment.

The criteria based on which it can be determined the economic contribution, achieved by exploiting patents and rights due to their author are (Nastase, 2000; Rivett and Kline, 2000; Muth and Lloyd, 1996):

- The invention is a new method for drilling in this specific technical field from 1934, by changing the composition of the shaft drilling and by achieving the percussion at the level of bit drill;
- This method of digging is considered today as being the basis of modern drilling, the process being applied generalized since 1937;
- Is changing the composition of the shaft drilling consists in introducing in its constitution of proportionate drill collars – a new product that was produced and is manufactured today;

- Currently, the proportional drill collars are used for all digging operations, coring, pumping, and any special construction and technical operations to which is intervening the effect of compression of the pressure caused by the fluid displaced by parts used in the operation. Proportional drill collars are used also at rotary table drilling, to explorations of wells, as well as to turbine drilling;
- Is ensured the weight necessary in achieving the pressure on the tool of advancement in its close proximity through a share from the weight of heavy pipe;
- Is dug and is coring perfectly vertical holes, eliminating deviations from vertical location during drilling of wells and of their duration to solve: breaking drill pipe, special fittings, drill collars, etc., as well as of pump rods and bottom equipment at the wells of oil extraction by Canadian pumping, etc., with favorable economic consequences (drilling cost reductions, of the duration wells completion and of extraction costs);
- Drilling indexes are improved significantly, especially the time of drilling decreases with at least 30%;
- Are deleted the exaggerated wears of drill pipes, of drill collars and of tool joints;
- Are achieved the optimal conditions for penetration into different hardness land formations and structures with high slopes;
- Is identified the exact depth and thickness of deposits due to verticality achieved;
- It is created favorable conditions for exploitation of wells into production by providing borehole verticality;
- Was reduced the cost of drilling and exploitation, at least in percentage, by reducing the duration of drilling;
- Increase the volume of oil extraction, respectively of incomes obtained through direct sales or of derivatives obtained by its processing;
- Intensify the metallurgical industry, which manufacture drill collars by increasing its number, required to execute boreholes;
- Additional revenue obtained through oil export activity, derivatives and drill collars;
- A great result of patent application in this case is that the technical solution to be of drilling at depths of over 2500m (upper limit in 1934), achieving drilling up to depths of 7000-8000m. Thus were discovered and exploited new deposits of oil, which is an embodiment of the invention which has different social connotations given that energy sources are essential to human life, society, petroleum and its products being the basis for all industries.

When determining the economic contribution of the exploitation of the analyzed patents, taking into account the above that confirms the reduction in the cost of drilling and the results of experiments conducted in 1938 by which was observed an increase of drilling speed by 33.8 % from wells dug by old specific processes in technique in 1934, we believe that the economic contribution achieved by exploiting the patents D. Eng. Basgan Șt. Ion is expressed as a coefficient of reduction in cost of drilling of at least 30%, which is the economic contribution made by the analyzed patents.

## 5. CONCLUSIONS

Assessment of the rights of the inventor is made taking into consideration the above criteria, confirmed by experiment, criteria that clearly puts us at the maximum rate established by common practice of about 40 years and which is known in the literature regarding the evaluation of intellectual property by the "25% rule" ("intellectual property- evaluation, mining, damages for infringement", chapter 22, published in 2008 IRECSO publisher (Gordon and Rusel, 1994). Considering the above we appreciate that to the author must receive a share of at least 25% of the fixed profit of 30%.

Please note that on setting the 25% were not considered the costs per meter drilled for wells dug at depths of 3000 meters, costs that are much higher than those for which it was calculated the

achieved profit (savings). Also were not taken into account the additional revenue obtained by increasing oil production due to the discovery of new oil deposits at depths of 3000 m and not included any positive financial effects caused by the increased on the market of the demand of drill collars, so additional revenue for additional production that has boosted the metallurgy and mechanical engineering industry.

Export growth was also a source of income caused by the enforcement of patents, revenues that were not taken into account in determining the economic contribution of 30%. All these sources of additional revenue, if taken into account, increase the calculated profit and the rights of the author, which allows us to consider that the calculation of the rights that we have considered of a minimum share of 25% which rests with the author is entitled to be so.

It should be noted that all additional revenues related to profit established at 30% and which were obtained as a consequence of patented inventions have entered totally into the Romanian State budget, entirely for the period of 1949-1959 for which are requested the industrial property rights already mentioned.

In this case, assuming that currently would apply the drilling method used before the appearance of Basgan Patent (1934) follows an updated cost price per meter drilling:

$$\text{The updated price of cost} = \frac{3486.53}{0.7} = 4980.76 \text{ lei/ m}$$

The total discounted cost of drilling, carried out during the period of validity of the Basgan Patent, is:

$$9042463\text{m} \times 4980.76\text{lei/m} = 45038338011\text{lei} \approx \\ \approx 45038338000 \text{ lei}$$

Considering a stable economy of 30%, it follows that in the validity period of the Basgan Patent was made a profit of:

$$45038338000\text{lei} \times 0.3 = 13511501400 \text{ lei}$$

25% share of that returns to the inventor of the amount of profit (savings) is achieved by:

$$13511501400\text{lei} \times 0.25 = 3377875350 \text{ lei} \approx \\ \approx 3377875000 \text{ lei}$$

The amount of 3377875000 lei represents minimal rights due to the author of patents, as a result of exploitation of his invention.

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