

## THE CONDITIONS OF PELLET PRODUCTION DEVELOPMENT IN POLAND

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**Abstract.** Global trends of increase in prices of conventional energy sources, compatibility with trends for environment protection and the necessity to fulfill EU obligations result in price growth of sawmill by-products – raw material for the production of eco-fuels. Such circumstances create a huge chance for the improvement of efficiency of very often operating on the verge of profitability owners of those by-products – that is plants converting wood, which apart from selling those by-products to chipboard producers, pulp and paper industry or energy sector, should consider the possibility of refining them in the place where they have been created. Converting sawmill by-products into pellet significantly increases their value. However, the decision to launch such conversion involves high costs and entails substantial investments, therefore requiring recognition of the factors having an impact on the success of such venture: prices of sawmill by-products – raw material for pellet production, development prospects of domestic pellet market at the time of growing prices of conventional fuels, as well as the legal regulations imposing on the investors pro-ecological character of activities and analysis of the situation on the European pellet market, taking into consideration its quality demands and possible prices.

**Key words:** sawmill by-products, fuel prices, pellet market, development barriers

## PRICES OF SAWMILL BY-PRODUCTS

Poland accession to the European Union and the necessity to fulfill the obligations stipulated in the “Strategy for the development of renewable energy” [Strategia... 2001] which determine the increase of share of renewable resources in the balance of primary energy of our country to a level of 7.5% by 2010 resulted in a significant rapid growth of interest in wood waste. Tough competition on this market between 2000 and 2005 led

to a few times increase in prices of previously underestimated sawdust and bark [Mikołajczak 2006] (Fig. 1). Following the trend the prices of chips and small-sized residues that is the wood waste which always had its recipients namely the sector of wood-based panels as well as pulp and paper sector. Further increase in prices between 2005 and 2007 equally embraces all kinds of wood waste. Their recipients in summer 2007 were forced to pay twice as much as at the beginning of 2005. While in the spring time of 2008 the change in the previous trend was observed, namely wood waste prices began to decrease systematically. In the second half of 2008, due to the upcoming heating season, and later prevailing low temperatures as well as the problems with gas supply, increase in the prices of sawmill by-products was noted. Nevertheless, they did not equal the prices from parallel period of the previous year. At the beginning of the next year – 2009-annual, seasonal decrease in prices took place however, due to an intensive interest in paper chips by pulp industry, it was lower than expected. Prices of sawmill by-products in the first half of 2009 were on average 20% higher than in the first half of 2008.

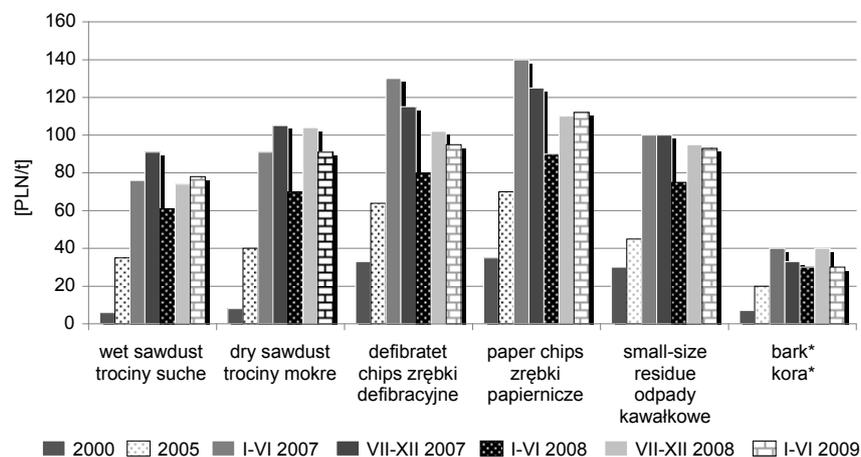


Fig. 1. Prices of forest residues in 2000, 2005, 2007, 2008 and the first half of 2009 (PLN/m<sup>3</sup>, \*PLN/mp)

Source: own research on the basis of producers' data.

Rys. 1. Ceny odpadów drzewnych w latach 2000, 2005, 2007, 2008 i w I półroczu 2009 roku (zł/m<sup>3</sup>, \*zł/mp)

Źródło: opracowanie własne na podstawie uśrednionych danych producentów.

From the graph presented on Figure 1 it can be seen that depending on their form, by-products from mechanical wood processing reach various price levels. Paper chips are the most expensive (112 PLN/m<sup>3</sup>). Prices of defibrated chips, wooden solid leftovers and dry sawdust stay at similar level of over 90 PLN/m<sup>3</sup>. The comparison of quoted prices proves the need for debarking prior to conversion. Chips obtained after chipping, free from contamination meet the expectations of more demanding recipients – paper industry, due to that reaching about 10% higher prices. Analysis of the data presented in

the graph shows that in recent years situation on the market of sawmill by-products stabilized what encourages investments in eco-fuels produced on the basis of those by-products.

## DEVELOPMENT OF DOMESTIC MARKET

The need for at least partial independence from unreliable and price-wise unpredictable importers of oil and gas as well as constant increase in prices of conventional fuels is a chance for the development of eco-fuels. Of crucial importance is also the introduction of legal regulations persuading investors to behave pro-ecologically as well as overcoming numerous barriers hindering the development of pellet market in Poland.

### Prices of conventional fuels

In the period between year 2000 and 2008 in Poland (Fig. 2) there was the most significant increase in the price of fuel oil. Its price in the given period rose 2.5 times. At a similar pace the prices of firewood rose. There were very insignificant changes in the prices of electric energy while gas price has increased by 74%. In the upcoming years the tendency is expected to grow, namely the prices of gas, fuel oil and electric energy are said to increase [Mikołajczak 2008].

However for the profitability evaluation of a given energy carrier the price factor as such is not a fully sufficient criterion. Establishing the total operating cost of heat unit, also known as the cost of obtaining useful heat unit, its value is derived from the following formula [Bal and Piechocki 2006]:

$$K_u = \frac{C_p}{Q_w \times \eta_k} \quad (1)$$

where:

- $K_u$  – costs of obtaining usable heat unit (PLN/GJ),
- $C_p$  – fuel cost per unit (PLN/t or PLN/m<sup>3</sup>),
- $Q_w$  – fuel calorific value (GJ/t or GJ/m<sup>3</sup>),
- $\eta_k$  – efficiency of heating system (%).

In Table 1 the operating costs of heat unit obtained from various fuels have been compared. The data shows that chimney wood is the cheapest and at the same time the least expensive energy carrier, which however requires constant hearth supervision. Wooden briquettes which are 15% more expensive than wood, from ecological point of view may be an alternative for cheaper coal and from the economic point of view for the significantly more expensive (by 73%) gas. Also pellet, the most expensive but at the same time the most stable and homogeneous biofuel is competitive both ecologically and economically when compared with gas and the remaining conventional fuels, excluding coal.

Table 1. Utilization cost of heat unit obtained from various fuels during heating season 2007/2008

Tabela 1. Koszt eksploatacyjny jednostki ciepła uzyskiwanego z różnych paliw w sezonie grzewczym 2008/2009

Type of bio-fuel Rodzaj paliwa	The costs of obtaining usable heat unit Koszt uzyskiwania użytecznej jednostki ciepła (PLN/GJ)			Price equivalent obtained from pellet heat unit Równoważnik cenowy uzyskiwania jednostki ciepła z granulatu	Heating system efficiency Sprawność urządzenia grzewczego (%)
	2005/2006	2007/2008	2008/2009		
Firewood Drewno kominkowe	17.68	22.70	30.61	0.74	70
Wooden briquettes Brykiety drzewne	29.60	32.49	35.31	0.85	80
Pellet Granulat drzewny	35.19	38.76	41.34	1.00	86
Cube coal second class Węgiel kostka gat. II	19.29	24.68	30.86	0.75	70
Coal Węgiel ekogroszek	30.38	27.53	34.29	0.83	70
Natural gas Gaz ziemny GZ 35/GZ 50*	45.86	49.51	61.04	1.48	88
Fuel oil Olej opałowy	71.55	80.50	74.54	1.80	86
Liquid gas LPG Gaz płynny LPG	90.35	104.64	123.58	2.99	88
Electric energy, night tariff G12 Energia elektryczna, taryfa nocna G 12	60.00	83.00	105.56	2.55	100
Electric energy, 24-hour tariff G11 Energia elektryczna, taryfa dzienna G 11	106.00	122.00	138.89	3.36	100

\*For heating season 2008/2009 – high-methane gas GZ 50 (85% households).

Source: own research on the basis of producers' prices.

\*Dla sezonu grzewczego 2008/2009 – gaz wysokometanowy GZ 50 (85% gospodarstw domowych).

Źródło: opracowanie własne na podstawie cen producentów.

### Buildings energy certificates

Regulations of amended Act – Construction Law [Ustawa... 2007], from 1st January 2009 imposed on the developers as well as the owners of buildings to be sold or rented obligation to possess energy performance certificates. Energy certificate is the document which determines the amount of required energy (heating, hot water, ventilation,

air-conditioning etc.), stemming from the function and standard of individual building as well as its installation standards. The directive of the Ministry of Infrastructure from 6th November 2008 regarding the methodology of calculating building or flat energy characteristics and the means of its preparation and certificate specimen [Rozporządzenie... 2008], containing act executive regulations promotes heating buildings using renewable resources (fireplace wood, briquettes and pellet). Using adequate conversion factors leads to lowering calculated original energy, what enhances building energy attractiveness. Undeniably, it will have a significant impact on the growth of demand for eco-fuels obtained from biomass, especially that from sawmill by-products.

### **Barriers of growth of domestic demand**

Poland is currently one of the largest European pellet producers. Nevertheless, rather small share of that production is distributed on the domestic market. In 2008 out of 425 000t only 28% of the product stayed with domestic recipients. The reasons for such situation could be traced in the lack of visible economic stimuli for investing in pellet burning installations, instability of supply and prices as well as competition from coal and coal breeze. Development of pellet market requires implementation of financial instruments encouraging potential clients to purchase necessary heating systems. For example in Germany, investor gets a refund of costs amounting to 56 Euro for each 1 KW of boiler power, while in Ireland one may count for a partial reimbursement of costs related to the purchase of boiler, it is a fixed sum of 4 000 Euro. Financial encouragement and breakthrough of some psychological barriers may significantly influence the growth of domestic demand which potential, due to the number of citizens, is enormous. Just to compare in small (9 million citizens) Sweden in 2008, 1 700 000 t of pellet were sold, that is 24-times more than in Poland with its population of 38 million.

The barrier of pellet market development in Poland is also the lack of adequate educational and marketing actions, aimed at investors and the owners of detached houses. Slightly better situation may be observed on the market of institutional boiler houses (district, urban), financed by EU funds. Unfortunately, institutional investors, often forget about securing comfort and savings while operating fixed installations and make technical mistakes (for example: manual boiler loading or the lack of tanks for pellet), prompting users negative opinions regarding that fuel.

The recipients who are the easiest to win for purely economic reasons are, as it has been presented in table 1, the users of fuel oil and liquid or even natural gas or electric energy. Among them there are industrial boiler houses, some hotels, swimming pools and schools. Change of energy source, would let this group of clients possess a dozen or so thousands of boilers to lower heating costs even by a few dozens percent.

Other group of potential clients could be formed by stove users, especially kilns which became extremely popular world-wide. They are used not just in houses but also in restaurants, smaller offices and shops. Single pellet supply guarantees heating for three days. Purchases of those appliances are hampered in Poland by the fashion for fireplaces. Their users in Italy substantially contributed to the increase in pellet consumption in that country.

## EUROPEAN PELLET MARKETS – OUTER DEMAND

Pellet market in Europe may be currently estimated at over 8.5 million tonnes burnt in a dozen or so countries [Mikołajczak i Popyk 2009]. In 2008, in Europe 500 plants producing pellet were in operation. Their number is gradually growing, however its pace due to global economic crisis temporarily decreased. Despite that, numerous countries are still investing in the increase of capacity, forecasting in upcoming years the increase in both domestic consumption and import. Opening a dozen or so new plants in Spain, France, Slovenia, Czech Republic, Slovakia, Ukraine, Belarus and Balkan countries is a proof of it. Production in Russia grows rapidly, which similarly to Ukraine and Belarus possesses much higher raw material potential than Poland.

### Pellet prices on European markets

Pellet prices in individual countries differ, additionally undergoing seasonal variations. On an annual basis they start to grow at the end of August, reaching highest level in November and December. Subsequent months are also characterised by their rather high level. Drop in prices begins in March and lasts till June/July when pellet is the cheapest. This regularity however may be disrupted by various circumstances, such as severe or quite the opposite, mild winter, sudden increase in prices of other fuels or significant growth of capacity.

On Figure 2 pellet prices in selected EU countries have been presented. Graph analysis shows that Polish producers are price-wise competitive in comparison with the producers from other countries. The most expensive (255 Euro/t), characterized by the highest price stability – Swedish pellet, is twice as dear as Polish one. In accordance with prices from April 2009 the cheapest (192 Euro/t), among the countries of old EU Dutch fuel is 45% more expensive than Polish fuel. The only problem which a domestic producer of Polish pellet may be faced with is quality and what is linked to it, the need to use norms and certificates from the recipient's country. Gradual increase in the quality

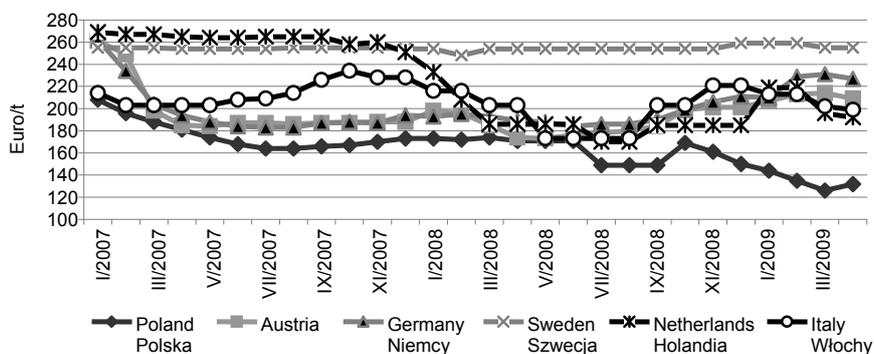


Fig. 2. Comparison of pellet prices in selected EU countries in the period from January 2007 till April 2009

Source: own research on the basis of data [PELLETS... 2009].

Rys. 2. Porównanie cen granulatu drzewnego w wybranych krajach Unii Europejskiej  
Źródło: opracowanie własne no podstawie danych [PELLETS... 2009].

of domestic fuel is also very important because of some threat from the expansion of price-wise attractive but quality-wise poor products from Russia, Belarus and Ukraine.

### **Quality requirements**

Success of each venture is conditioned by the market and its players, who may be characterised by certain needs, preferences and requirements. So as to operate there effectively, guaranteeing the company long-term sales at a satisfactory price, those requirements should be met. Currently many companies in various countries encouraged by excellent prospects for the development of pellet market decided to launch or expand its production. Expected, due to that, growing competition will eliminate from international market all companies which will be unable to guarantee stable product quality. Up till now observed lack of EU norms for eco-fuels results in the fact that the recipients placing quality requirements rely on the existing norms drew by four countries: Austria, Germany, Sweden and Italy, out of which the most strict Austrian ÖNorm M 7135. They also ask for adequate certificates and conformance testimony or the results of laboratory tests.

After ratification of EU norms which are being worked on for the last few years Polish producers willing to win and hold new markets will be forced to implement adopted regulations. In practice it will mean increasing quality demands as to sawdust used in production, the means of drying it and bigger diversification of its prices depending on its cleanness and as a consequence bigger diversity in prices of the final product created from that sawdust.

### **SUMMARY**

Global trends show that in the next few years European pellet market will develop what should become a significant stimulus for the increase of capacity of potential producers and exporters from Poland. The fastest growth of consumption is expected in the UK, Denmark, Sweden, Germany and Austria where in 2009 market is predicted to increase by 25-30% [Egger and Öhlinger 2009]. England in 2008 already recorded a rapid growth in pellet consumption – up to 750 000 t. Some hopes are linked to such old EU countries as Ireland, Belgium and the Netherlands having a rich fireplace tradition. On those demanding markets, Polish producers should compete not just using low price, which is also offered by the producers from the former Soviet Union countries but mainly offering high quality products. Such good prospects are not guaranteed by domestic market. Change of attitude of some part of the society still accounting coal as the most common and natural gas as the most comfortable conventional fuel will be difficult and is bound to take a few years. Among the barriers halting the increase of pellet consumption in Poland there are: weak distribution chain and the lack of proper financial instruments supporting, from one hand, the producers of new heating systems and pellet and from the other their users.

Development of pellet market in Europe to a large extent depends on deciding whether the fuel will be used in the future mainly in small installations for heating houses, schools and shops or in big power plants where it could substitute large volumes of coal. In case of the market dominated by institutional and industrial recipients even more dynamic development may be expected.

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## UWARUNKOWANIA ROZWOJU PRODUKCJI GRANULATU DRZEWNEGO W POLSCE

**Streszczenie.** Ogólnoświatowe tendencje wzrostu cen konwencjonalnych źródeł energii, zgodność z trendami ochrony środowiska oraz konieczność wypełnienia zobowiązań unijnych wpływają na wzrost cen tartacznych produktów ubocznych – surowca do produkcji paliw ekologicznych. Okoliczności te stwarzają ogromną szansę na poprawę efektywności, działających, często na granicy opłacalności ich dysponentów, zakładów mechanicznej obróbki drewna, które, oprócz sprzedaży odpadów producentom płyt wiórowych przemysłowi celulozowo-papierniczemu czy energetyce, powinny rozważyć możliwość ich uszlachetniania (przewartościowania) w miejscu powstawania. Przetworzenie tartacznych produktów ubocznych w granulaty drzewny znacząco podnosi ich wartość. Jednak podjęcie decyzji o uruchomieniu przerobu, związane z poniesieniem wysokich nakładów inwestycyjnych, wymaga rozpoznania czynników mających wpływ na powodzenie przedsięwzięcia: cen tartacznych produktów ubocznych – surowca do produkcji granulatu, perspektyw rozwoju krajowego rynku granulatu drzewnego w warunkach rosnących cen paliw konwencjonalnych oraz przepisów prawnych, skłaniających inwestorów do zachowań proekologicznych, rozpoznania sytuacji na rynku granulatu w Europie, z uwzględnieniem jego wymagań jakościowych i możliwych do osiągnięcia cen sprzedaży.

**Słowa kluczowe:** tartaczne produkty uboczne, ceny paliw, rynek granulatu, bariery rozwoju

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