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Sawmilling in the Czech Republic

Pilinarstvo u Republici Češkoj

Review paper • Pregledni rad

Received – Prispjelo: 12. 3. 2009.

Accepted – Prihvaćeno: 23. 7. 2009.

UDK: 630*822.03; 630*832; 674.093

ABSTRACT • This article deals with the development of sawmilling over the area of the Czech Republic from the invention of the waterwheel drive until the present day. This survey is based on the writings of various Czech authors who were engaged, or still are, in this subject. The two most common types of machines in water-driven sawmills were both used at that time: the single-blade vertical frame saw and, less often, the horizontal saw. The development of the steam engine drive can be traced to the second half of the 19th century, while electric power generation with a dynamo was first introduced to some mills at the turn of the 20th century. During the 19th century, a new sawing machine was developed: a multi-blade frame saw with all-metal construction. As it turned out, this type of machine dominated the entire 20th century. In the year 1918, an independent Czechoslovakia was established, and sawmilling, just like other branches of industry, thrived in the new environment. Alas, the favorable conditions for development were impaired by World War II, and soon after that by nationalization and an imposed, centrally-planned economy. In the period 1945 – 1948, during overall nationalization, most sawmills were either closed or converted to other operations. The timber industry was not classified as an important sector and was therefore one to be reduced. Compared with the number of sawmill units in 1925, there was a sharp drop of 80% in the early 1950s, and as much as 90% in 1986. Nevertheless, the velvet revolution in 1989 restored freedom of enterprise and Czechoslovakian traditions. Wood processing experienced an outstanding revival and restructuring of the entire industry.

Key words: Czech sawmilling industry, development, sawmills, sawmilling products, technology

SAŽETAK • U radu je predstavljen razvoj pilinarstva na području na kojemu se danas nalazi Republika Češka, i to od vremena pogona vodenim kolom do danas. Rad je utemeljen na objavljenim tekstovima autora koji su se bavili ili se još uvijek bave tom temom. Najčešće upotrebljavani strojevi u vrijeme pogona vodenim kolom bili su jednolisna pila jarmača i, nešto rjeđe, horizontalna pila. Parni se pogon u pilane uvodi u drugoj polovici 19. stoljeća, a električni pogon na prijelazu iz 19. u 20. stoljeće. Tijekom 19. stoljeća razvio se novi pilanski stroj: višelisna pila jarmača s metalnim okvirom. Taj je stroj bio dominantan tijekom 20. stoljeća. Godine 1918. ustanovljena je neovisna država Čehoslovačka i pilinarstvo se, kao i druge industrije, razvijalo u novom okruženju. Na taj je razvoj znatno utjecao Drugi svjetski rat, nacionalizacija koja je uslijedila te planska ekonomija. Od 1945. do 1948. godine, tj. u vrijeme nacionalizacije, brojne su pilane zatvorene ili prenamijenjene. Prerada drva nije smatrana važnim sektorom gospodarstva i stoga je reducirana. U usporedbi s brojem pilana i količinom prerađenog drva 1925. godine, u ranim 1950-tim godinama 20. stoljeća zabilježen je pad od 80 % te pad prerade drva od čak 90 % u 1986. godini. No 1989. godine uspostavlja se sloboda poduzetništva i, ponovno, čehoslovačka tradicija. Industrija prerade drva oživljava i počinje restrukturiranje cjelokupnoga industrijskog sektora.

Ključne riječi: češko pilinarstvo, razvoj, pilane, pilanski proizvodi, tehnologija

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1 INTRODUCTION

1. UVOD

Wood is a natural material and presents a great variety of characteristics. Throughout the history of wood-working, each specific feature influenced the technology used to process it, which had a related impact on the social distribution of labor, and especially on the development of specialized crafts and trades. New modern wood processing technologies, which continue the old craftsmanship traditions, go hand-in-hand with the implementation of skills and experience arising from new developments in the industry, as well as in other industries. Nevertheless, converting a natural product (trees) into a useful technical material is far from easy. Sawmilling processes should primarily homogenize the mechanical and structural characteristics of wood into a technically defined material. Last but not least, the operational waste should be converted into raw materials for further processing. Timber production (beams, planks, deals and battens, etc.) from round wood is probably one of the oldest technologies, along with stone working, that people managed to master. At the very beginning, the required profile was made by cutting a piece of round wood with primitive tools. A new stage in this development came with the introduction of sawing, which initiated higher productivity, material savings and the possibility of making thinner products (Friess, 2003).

Sawmilling and wood processing have a long tradition in the Czech Republic. However, that tradition was interrupted during the communist era following the Second World War, when our economy was incorporated into the complex of RVHP (Council of Mutual Economic Aid) and our woodmilling industry was relegated to a low priority class. After independence was gained, our private enterprise boomed in the area of woodmilling as well, but the lost continuity soon started to create problems for many of the new entrepreneurs in that branch of industry, despite the seeming ease and simplicity of initial operations. There is quite a good raw-materials base for the wood processing industry in our country, with annual felling output of about 14mil cubic meters of wood. More than 40% of that volume is processed through sawmilling technology. Wood, as a natural material, is now also increasingly used by the building industry, which had neglected wood applications dramatically in the past and looked for various substitute materials. The wood processing industry is on track to match that new trend, but catching up with the Western European countries will take some time.

2 WATERMILLS AND SAWMILLS

2. MLINOVI I PILANE

The first sawmills with mechanical propulsion were linked to the water corn mills which were introduced into our country from Anatolia. The oldest recorded information on watermills across our country dates back to the 11th century (Štěpán *et al*, 2000).

Sawmilling became the most common side operation of watermills in the submontane and mountainous

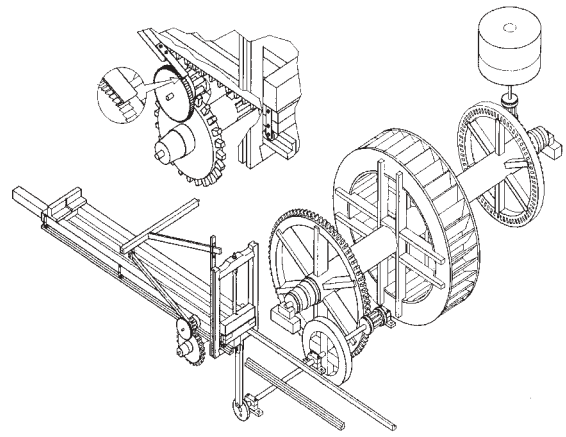


Figure 1 Peg gear driving a corn mill and sawmill added later in 19th cent. (Štěpán *et al*, 2000)

Slika 1. Zupčasti prijenos snage i gibanja za pogon mlinova i pilana u 19. stoljeću (Štěpán *et al*, 2000)

regions. The sawmilling operation was usually separated to the outdoor area of the corn mill to prevent vibration transfer within the mill structure (see Fig. 1). Further wood processing activities were adopted: bark-crushing (for tanning shops), grinding of sawdust and charcoal for gunpowder production, wood-turning, and wood-wool production (Štěpán *et al*, 2000).

The importance of sawmilling in the 18th and 19th centuries can be grasped after realizing the enormous quantity of buildings that had to be constructed at that time. Different business strategies could already be distinguished. Sawmills integrated with corn mills operated within a system called “sawmilling for wage” – i.e. customers sent their own round wood to the mill for processing. Specialized water-driven sawmills operated commercially, mostly purchasing raw round wood for stock. Propelling more machines was achieved by installing a cascade of waterwheels, in cases where the topography and water resources allowed for such an arrangement (Friess, 2006). In the 1830s, the development of a new highway network created opportunities for new wood markets. In addition to a widening of the domestic market, wood began to be exported. Not only lumber but also special products, e.g. trunks up to 50 m long for masts, were shipped to Hamburg. Historical sources have records on the sawmill boom from the end of the 19th century, which give detailed examples from the hilly regions of Bohemia; they say that sawmills were as close to each other as the slope of the river allowed. Common machinery in those sawmills: single-blade vertical frame saws “a single” (Augsburg type) and “Wallachian” (Venetian type). The first type was driven by an usual waterwheel via spur gear (with wooden pegs) to get the saw crankshaft speed in the range of 60 to 110 rpm. The second type was used mostly in the Moravia region. The drive for an overshot waterwheel was smaller because the strong stream of falling water provides the required speed without a gear. These sawmills were being built as independent plants until the beginning of the 20th century (Fig. 2). As late as 1925, there were statistical records of over 1000 such sawmills in Bohemia and Moravia. However, by the middle of the 20th century those plants had



Figure 2 Water-driven single blade sawmill restored at a watermill in 1796 (Štěpán *et al*, 2000)
Slika 2. Vodom pogonjeni pilanski stroj s jednim listom pile iz 1796. godine (Štěpán *et al*, 2000)

perished. The new vertical multi-blade frame saw, of all-steel construction with feeding rolls, had prevailed. This saw had been designed and further developed throughout the 19th century, so that by the turn of the 20th century, its principle design was more or less identical with contemporary machines (Friess, 2003).

Millers and “hatchet-men” mostly built vertical “singles” but sometimes also horizontal single-blade machines (Fig. 3). These were useful for processing



Figure 3 Water-driven sawmill with a horizontal blade built at Dolní Sloupnice in 1854; moved to the Open-Air Museum of Folk Architecture Vysočina (Štěpán *et al*, 2000)
Slika 3. Vodom pogonjena pilana s horizontalnim listom pile izgrađena u Dolní Sloupnice 1854. godine; premještena u Muzej narodne arhitekture na otvorenome u Vysočini (Štěpán *et al*, 2000)

very large diameter trunks, which remained fixed onto the support while the cutting position was adjusted by a moving frame with a horizontal blade, controlled by a hand-crank (Štěpán *et al*, 2000).

The wooden construction of the sawing machine (some of them operating until the middle of the 20th century) usually allowed for the installation of one cutting blade only. The number of blades used to be limited because the wooden peg gears could transfer a maximum power of 4-6 HP, and so it was not possible to install more blades onto one frame. This became possible only after the introduction of steel cogged wheels and band wheels for transmission. But the wooden “singles” machines could work in pairs, or even in a line installed in one building, if there was an adequate water power source. This is documented in drawings of the well-known “Čeňkova” sawmill from 1856, where two waterwheels with diameter of 350 cm and width of 185 cm powered four “singles” for an increased mill output. (Fig. 4) (Štěpán *et al*, 2000).

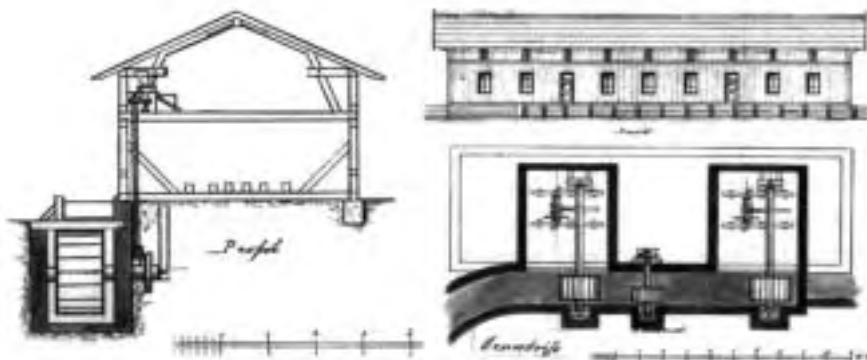


Figure 4 Building plan: a sawmill with four single-blade frames, supplemented with one corn mill installed in the attic; two large waterwheels powered four saw frames, and one smaller waterwheel drove a millstone (Štěpán *et al*, 2000)
Slika 4. Plan gradnje pilane s četiri jednolisne jarmače i jednim mlinom instaliranim u potkrovlju; dva velika vodena kola pogone četiri jarmače, a manje vodeno kolo pogoni mliniski kamen (Štěpán *et al*, 2000)

Table 1 Number of sawmills in 1925

Tablica 1. Broj pilana 1925. godine

Country <i>Država</i>	Propulsion / <i>Pogon</i>			Machinery / <i>Stroj</i>			
	water <i>voda</i>	steam <i>para</i>	electro <i>električna struja</i>	single-blade <i>jednolisni</i>	frame <i>jarmača</i>	circular <i>kružna pila</i>	band <i>tračna pila</i>
Bohemia	1 261	429	77	675	1 422	1 339	106
Moravia	495	205	11	330	604	558	43
Silesia	120	77	6		330	5	4
Total / <i>Ukupno</i>	1 876	711	94	1 005	2 355	1 902	153
	2681			5416			

Source: Friess, 2003

The core machinery of the water-driven sawmill also used to have supplementary equipment, e.g. edging circular saws or grinding stones. Hand-driven winches were used for pulling trunks into the sawmill shop.

There was also a specialized type of sawmill – shingle mills, which replaced the hand cutting of shingles. The oldest record about them that we have dates back to 1824. They became common, however, in the middle of the 19th century. The equipment of those shops included a circular saw, grooving machine, and occasionally a mechanical planer. They produced shingles until the end of the Second World War (Štěpán *et al*, 2000).

3 SAWMILLING IN THE 20th CENTURY 3. PILANARSTVO U 20. STOLJEĆU

3.1 Sawmilling history up to 1989

3.1. Povijest pilanarstva do 1989.

Steam engine propulsion (mostly loco-mobile) enabled the spread of sawmills even into areas with few water power resources, but with advantageous supply and marketing conditions (Fig. 5). The wood industry Yearbook of 1925 fixed the total number of sawmills in Bohemia and Moravia at 2 681 (Tab. 1). In 1930 there were only 1 874 sawmills registered in Bohemia and Moravia, but this number only includes plants with more than 10 employees.

Similarly to the solid Czech technological background, adequate round wood production and marketing conditions also created a favorable climate for sawmill operations. Pre-war Czechoslovakia used to be a significant European timber supplier, exporting its production to Germany, Austria, Italy, France, England, the Netherlands, and so on; (Friess, 2003).

Companies were also interested in importing, especially exotic woods. Although woodworking machinery and tools were produced domestically, modern machines and technology were imported as well, especially from Scandinavia (Friess, 2003).

Favorable conditions and promising developments were impaired by World War II, and soon after that by nationalization and the imposition of a centrally planned economy. During nationalization, most sawmills were either closed or converted into other substitute operations, because the timber industry was not classified as an economic sector of national importan-

Table 2 Sawmills in 1947 (before nationalization)

Tablica 2. Pilane 1947. godine (prije nacionalizacije)

Sawmills / <i>Pilane</i>	Number / <i>Broj</i>
Czech mills / <i>češke pilane</i>	37
Moravia-Silesia mills / <i>moravske pilane</i>	25
State forest and farm / <i>državne šume i farme</i>	130
Other private / <i>privatne pilane</i>	1586
Total / <i>Ukupno</i>	1778

Source: Friess, 2003



Figure 5 Archbishop steam sawmill in Chvalčov (Kozlanský, 1947)

Slika 5. Nadbiskupska parna pilana u mjestu Chvalčov (Kozlanský, 1947)

ce. Production of woodworking machinery survived in the product mix of two large engineering companies (Královopolská strojírna Brno and TOS Svitavy) and on a small scale in the maintenance shops of wood processing companies (Friess, 2003).

The era of nationalization and central economic management meant the destruction of nearly all traditional forms of skills and experience transfer, which was common in the woodworking trade of the past; these transfers continued without any disruptions in neighboring countries (Friess, 2003).

In 1947, before complete nationalization, 1 778 sawmills were operating across the area of the present-day Czech Republic (Tab. 2) (Friess, 2003).

Table 3 Survey of sawmills by processed wood volume in 1970

Tablica 3. Pilane prema obujmu prerađenog drva 1970. godine

Wood enterprise <i>Poduzeće</i>	mills <i>pilane</i>	Sawing volume in 1000 m ³ /year / <i>Prerađeni obujam u 1000 m³/godini</i>								
		< 3	3-5	5-10	10-15	15-20	20-30	30-40	40-50	> 50
Středočeské	18		1	6	4		4	3		
Jihočeské	35	1	2	11	14	1	2	1	1	2
Západočeské	31	2	2	12	9	2		1	1	2
Severočeské	16		1	1	4	3	3	2		2
Východočeské	25	1		5	10	5	3	1		
Jihlavské	15			4	5	3	3			
Středomoravské	20			7	6	1	3	2		1
Severomoravské	34		2	4	9	8	3	3	2	3
Solo	4			1	2		1			
Total number	198	4	8	51	63	23	22	13	4	10

Source: SDP, 1971

Table 4 Number of sawmills in 1986

Tablica 4. Broj pilana 1986. godine

Wood enterprises / <i>Poduzeća</i>	Number / <i>Broj</i>
Středočeské	15
Jihočeské	29
Západočeské	26
Severočeské	12
Východočeské	20
Jihomoravské	33
Severomoravské	29
SOLO	4
Total / <i>ukupno</i>	168

Source: Friess, 2003

Soon after, at the beginning of the 1950s, between 400 and 500 sawmills were operating in our country (5,100 in Austria at that time, and even more registered sawmills in Germany) (Pražan *et al*, 2007). The number of sawmills in 1970 is given in Tab. 3.

The peak concentration can be seen from the number of sawmills in 1986: approx. 168 sites (plants within VHJ DP) (Tab. 4). Nevertheless, there were some smaller sawmills, outside the centrally managed wood processing industry, which operated inside agricultural co-ops – JZD or other state forest enterprises. However, the centrally managed sawmills accounted for all planned processing of round wood, and outsiders had to search for other wood resources, mostly of “non-standard” quality. The scheduled 168 sawmills processed 90% of available round wood (Bomba *et al*, 2009).

3.2 Sawmilling history from 1989

3.2. Povijest pilanarstva od 1989. godine

Since the beginning of the 1990s, the wood processing industry has been undergoing major restructuring. Large state-owned enterprises were breaking up

into smaller independent companies during the restitution and privatization stage. Some companies were doing well at that time because of their flexibility and good marketing strategies, in both the developing economic environment and Czech timber trade. Foreign trade, however, which was focused mostly on stable Western European markets, was dying out, and finally the structure of its sales force collapsed. Only large-scale producers were able to manage their own marketing (Fig. 6). In addition to independent trading on foreign markets, new mediation agencies were emerging. The segments of established customers were stable and solvent, so there were no strong oscillations in the volume of timber marketed (Janák, 1999).

Sawmilling was becoming a lucrative enterprise. Some sawmills, which had closed in previous years, re-opened and tens of new small sites appeared, processing mostly round wood. They were either new owners of woodland given in restitution, looking to profit from processing their own wood, private entrepreneurs, or limited liability companies, taking the opportunity to achieve a quick return on capital by buying and processing the available round wood. The latter group of businessmen organized their business according to the principle “build cheaply to make money fast”, which had the following effects: most of the newly-constructed mills put into operation had a low or even primitive technical and technological level; a high rate of manual work providing low productivity (mainly between 1990 – 1993); marketing problems for Czech producers of machinery and technological equipment, causing their productions to shut down; increase in processing capacity to about 145–160% of the level at the end of the 1980s; decreasing availability of round wood, which led to sharp price increases on the free market; new operations were often owned and managed by people without experience and adequate education in wood processing, and in some extreme cases even by people without any interest in wood processing technology (Janák, 1999).



Figure 6 Čáslav Sawmill (taken by author)
Slika 6. Pilana Čáslav (foto: Bomba)



Figure 7 One of the largest plants in the Czech Republic – Paskov (TL, 2008)
Slika 7. Jedna od najvećih pilana u Republici Češkoj – Paskov (TL, 2008)

4 RECESSION 4. RECESIJA

In the second half of 1992, a downturn in the timber trade struck not only our country, but also Western European markets. In 1995, the balance of sawn and round wood prices was disturbed. Because of a fall in timber prices on Western European markets, where most Czech sawmills directed their exports, the export prices of sawn wood started to go down as well (Pražan, 2003).

Some sawmills closed, while others struggled to keep going, went into debt with financial institutions and their wood suppliers, and finally had to close their doors as well. Small and medium-sized firms were even more affected, as were companies which had a narrow selection of products, and could not promote salable products to compensate for the losers. Alas, after the preceding developments, most entities were in such a situation. Later on, the plants were sold for a bargain. Some foreign investors also began looking for these bargains, especially for larger plants with a cheap labor force, which could become quite lucrative for them (Janák, 1999).

5 NEW MILLENIUM 5. NOVO TISUČLJEĆE

In the year 2003, construction of a new mega-sawmill got underway in Paskov (Fig. 7). In the years that followed four more such mega-structures were

completed – the last examples of capacity concentration in Western Europe. Currently in the Czech Republic there are 5 mega-sawmills, which had an annual round wood capacity of 4 060 000 cubic meters of wood in 2007 (Pražan *et al*, 2007).

From a global perspective, foreign markets are essential for these large companies. Having secured adequate raw material resources of the required quality and logistics supply, they are always able to meet their customer's needs quickly and economically (Janák, 1999).

When large-scale producers focus on large contracts, it is favorable for more than just their own effective operations, due to the “economy of scale” effect. They can cover large volumes with a narrow range of products, and there is no need for producers to follow the “everybody makes everything” path, as is often the case. Small special orders and customized production for small customers can be allocated to small suppliers. These suppliers do not stand a chance of competing in the area of bulk contracts with the same product lines as large sawmills. Accepting small orders for a wide range of products is more favorable for smaller producers (revenue) and their customers as well (flexibility, delivery time). After all, some atypical sizes (e.g. long building lumber) cannot be made at large sawmills at all. Competition between medium (large) and small sawmills could be less intense, to the benefit of both sides (Janák, 1999).

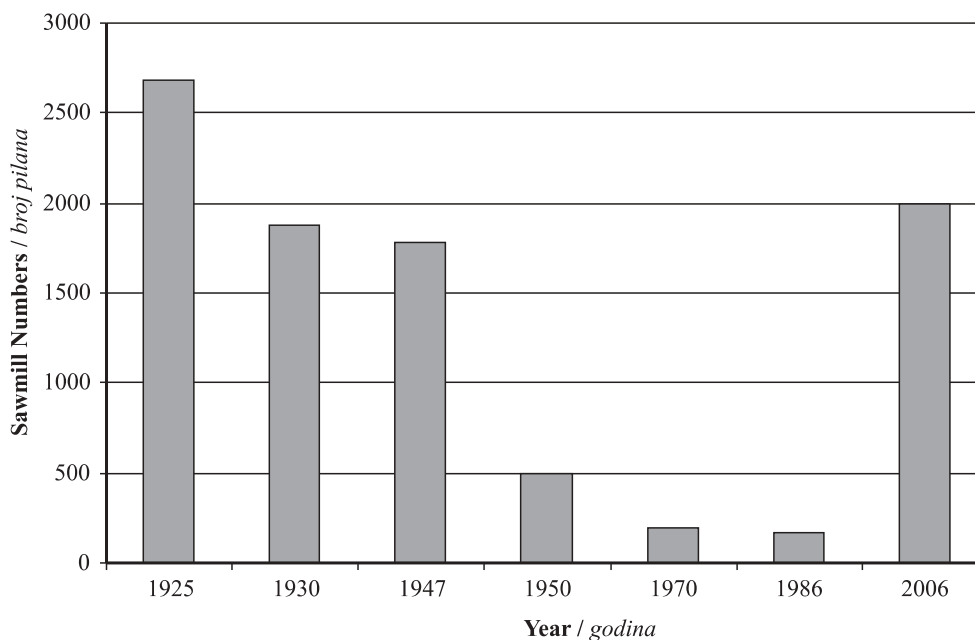
No further construction of large-scale sawmills inside the Czech Republic is planned (Pražan *et al*,

Table 5 Breakdown of sawmills in 2007

Tablica 5. Ukupni prorez pilana 2007. godine

Size <i>Veličina</i>	Capacity <i>Kapacitet</i>	Number <i>Broj</i>	Aggregate capacity, m ³ /year <i>Ukupni kapacitet, m³/god.</i>	Share of the total, % <i>Udjel u ukupnom prorezu, %</i>
largest / <i>najveća</i>	> 500 000	5	4 060 000	54
large / <i>velika</i>	50 000 - 110 000	8	670 000	9
medium / <i>srednja</i>	20 000 - 49 999	30	1 050 000	14
small / <i>mala</i>	10 000 - 19 999	60	750 000	10
smallest / <i>najmanja</i>	< 9 999	1 400 - 2 000	1 000 000	13
Total / <i>Ukupno</i>		1 503 - 2 103	7 530 000	100

Source: Pražan *et al*, 2007



Note: in 1930, only mills with over 10 employees are recorded; in 1947, the number of mills is recorded before total nationalization; in 2006, the number of sawmills is estimated.

Opaska: za 1930. godinu zabilježene su samo pilane sa više od 10 zaposlenih; za 1947. godinu naveden je broj pilana prije potpune nacionalizacije; za 2006. godinu broj pilana je procijenjen

Figure 8 Graph of sawmill development in the Czech Rep. from 1925 to 2006 (Bomba *et al.*, 2008)

Slika 8. Promjena broja pilana od 1925. do 2006. godine

2007). An actual breakdown of sawmilling plants is given in Table 5.

Among large and medium-sized sawmills in the Czech Republic, there are about 1 700 small and very small sawmills, scattered over the whole country (Pražan *et al.*, 2007), which process local round wood resources and supply customers who are either very near or not far away. Some of the mills have a long tradition in their neighborhoods, and their existence and operation is often a link in the chain of local operations of further producers.

Development in the Czech Republic is presented in Fig. 8.

6 CURRENT MARKET SITUATION

6. TRENUTAČNA SITUACIJA

During recent years sawmilling companies have experienced many ups and downs. For these companies, not only the round wood – timber price balance, but also the demand for sawn timber is crucial, especially on foreign markets. Because of the steadily falling price of building timber, 2005 was an unprofitable year. 2006, thanks to the rising prices of timber, marked a turning point for an even better 2007 after the sharp fall of round wood prices. However, in the 4th quarter of 2007, prices of round wood went up again dramatically, while timber prices fell. This negative trend continued during 2008 with the effect that most sawmill companies barely broke even (with zero profit). The reason for the steady fall in building timber prices has been sluggish marketing of timber on foreign markets, especially due to the mortgage crisis in the American market, which is now spreading to Europe. The prolonged swings of the market pen-

dulum, bringing about turbulent periods of profit and loss, are making the sawmilling companies establish operational reserve funds and carefully judge all investment projects. Most companies now only process that product line which is vital to keeping their operations running (Truhlářské listy, 2008).

7 STATE OF TECHNOLOGY

7. STANJE TEHNOLOGIJE

7.1 Large-scale sawmills

7.1. Vrlo velike pilane

These plants are equipped with the most sophisticated technology of renowned machinery manufacturers. The core operation of these plants is based on aggregate processing lines, comprising chipping machines and circular saws. Bucking, sorting and stacking operations are regularly automated. High-capacity drying chambers and sometimes other supplementary production are also common equipment in these plants (Fig. 9).

7.2 Large and medium sawmills

7.2. Velike i srednje pilane

Considering the competitiveness of domestic sawmills, it is necessary to judge their actual state as well as possible modifications. Sawmills of that class usually operate with an annual capacity of processed round wood within the range of 20 000 to 110 000 m³/year. Their core equipment is a frame saw - usually twins, which stems from a Czech tradition of producing quality machines with lower investment demands. Bucking and edging centers are separated and have manual



Figure 9 Stock-yard of Chanovice sawmill (photo by author)
Slika 9. Stovarište trupaca u pilani Chanovice (foto: Bomba)

handling. Size sorting is usually mechanized but quality sorting and stacking is manual. Although only larger plants have adjusting centers, driers are rather common equipment. Some plants also have impregnating troughs. The average equipment age is approx. 30 years. When the production efficiency of our plants is compared with foreign counterparts we find lower productivity, i.e. demands for higher specific staffing. That trend is also sustained by the higher unemployment rate and lower labor costs in our country. Our plants have the advantage of being able to process a larger range of timber length (from 3 to 6 meters, while foreign plants often can only process 4 meters). Equipment that is functional but mainly highly amortized will soon require refurbishment and exchange of machinery in a great number of plants. Replacing existing technologies with more productive ones, e.g. aggregate processing lines, is not usually a realistic solution – it calls for large-scale reconstruction and high investment costs. Another reason for that situation is the raw materials base, which is currently about 30–35% below the total processing capacity of sawmills. Implementing new band head saw technology instead of using frame saws has little impact on productivity, but there are other obvious advantages like flexibility, improved accuracy and the ability to saw large diameter round wood. Restructuring the bucking and edging operations is undoubtedly realistic, and can save a considerable amount of labor. Manipulating and sorting round wood is usually done on stationary or mobile manipulation lines.

7.3 Small and very small sawmills

7.3. Male i vrlo male pilane

These sawmills have similar machinery and equipment to that of medium-sized plants. The distinction is their lower capacity, adapted to the lower degree of mechanization of the sawing machine, or to lower performance models (Fig. 10). Manipulation of wood in the sawing shop is mostly done manually by means of track carts. When reconstructing such plants it is possible to suggest preserving the equipment, however the rate of horizontal band saw installations will rise (especially with very small plants). Many small plants also have drying chambers. Recently, a lot of small pro-



Figure 10 Small frame saw (photo by author)
Slika 10. Mala pila jarmača (foto: Bomba)

cessors have bought impregnating troughs for treating building timber. Forklifts are used for manipulation.

8 VISIONS FOR THE FUTURE

8. VIZIJA BUDUĆNOSTI

Very small plants (up to a round wood capacity of 3,000 m³/year) will continue to emerge and vanish according to their competitiveness with bigger rival companies. They will still run at lower operating costs but will lack the ability to complete larger batches and gain supply and financial reliability. Nevertheless, they can operate well in other arenas like processing wood “in wage”, i.e. round wood in possession of the customer. A different scenario can also not be ruled out – the medium and larger plants may continue to close, and their capacity of processing the major share of round wood may be taken over by those small and very small sawmills.

For securing sawmilling operations, some kind of linking will be necessary between round wood suppliers and sawmilling companies (either on a contractual or proprietary basis). Effective logistics in the supply chain, up to an uninterrupted sawing operation, will be a necessary, but not the only, prerequisite for effective production (Janák, 1999). The general situation in the forest industry does not assure an adequate availability of round wood. It is difficult to forecast the peak of its price rise as well as further developments in the timber market (Truhlářské listy, 2008). If any company is able to make some investments, then the money will be spent for upgrading production, not increasing capacity. Most probably, in the upcoming years companies will tend to keep their money in reserve funds (Truhlářské listy, 2008).

9 CONCLUSION

9. ZAKLJUČAK

Sawmilling and wood processing have a long tradition in the territory of the present-day Czech Republic. The first sawing machines were constructed at water-wheel-driven corn mills. There were also some water-mills, but such propulsion proved rather weak and unreliable in our environment. In the middle of the 19th century, steam engine propulsion enabled sawmills to spread into areas closer to consumers, in spite of the lack of water. At the turn of the 20th century, the onset of electrification initiated the installation of dynamos in hundreds of watermills. The “first” Czechoslovak Republic enabled the last boom of the sawmill industry. Then the Second World War, followed soon after by nationalization and a centrally planned economy, caused a sharp drop in sawmilling capacity and depressed the entire sawmilling industry. After the velvet revolution in 1989, many new small sawmills appeared and at the same time, a lot of large plants were closed. Sawmilling became a lucrative branch of profiteering. The 1990s were characterized by a turbulent restructuring of the woodworking industry, and this development is ongoing. The Czech Republic came back into the European economic environment, and this will inevitably require further restructuring of our woodworking industry. In any case, it is hard to compensate for missing producers through technology. Reconstruction of existing sawmills will also be very slow due to a general lack of capital. Some reopened sawmills are at the technological level of the 1930s, but they do not have managerial staff with the experience of experts back then. Lack of technical literature is also critical, since the fall of the industry sector affected publishing, as a result of negative developments in the woodworking industry (Friess, 2003).

The global economic recession, which started in 2008 and will surely continue in 2009, brought problems to sawmilling, and it is very difficult to forecast further developments (Bomba *et al*, 2009).

10 REFERENCES

10. LITERATURA

1. Bomba, J.; Friess, F. 2009: The development of sawmill industry in the Czech Republic [Czech]. In *Lesnická práce: Journal of Forest Science and Practice*, 2 (89): 32-33.

2. Bomba, J.; Šedivka, P.; Böhm, M. 2008: The development of sawmill industry in the Czech Republic with a view to their capacity and master machine. In *Coyous 2008. Conference of young research scientists*. Czech University of Life Sciences Prague. Faculty of Forestry and Wood Sciences: 17-25.
3. Friess, F. 2003: *Sawmilling I.* [Czech], University mimeographed. Czech University of Life Sciences Prague. Faculty of Forestry and Wood Science, p. 13-22
4. Friess, F. 2006: *Corporation size and strategy in sawmill industry* [Czech]. Prague: PowerPoint, p. 2 – 39
5. Janák, K. 1999: The state of sawmill industry in the Czech Republic [Czech]. In *Lesnická práce: Journal of Forest Science and Practice*, 5 (78):
6. Kozlanský, K. 1947: *Reconstruction of sawmills and wood-working enterprises* [Czech]. 1st. Ed. Prague: Jaromír Dolenský, Printing Office in Prague II, p. 109
7. Pražan, P.; Příkaský, F. 2007: The present state and development of sawmill industry in Central Europe and the Czech Republic with the focus on small and medium sized enterprises [Czech]. In *Proceedings of Wood-Working Industry in the Czech Republic - present and future development of this industry*. Brno, p. 21-30.
8. Pražan, P. 2003: The development of sawmill industry in the Czech Republic and its impact on wood price [Czech]. In *Lesnická práce: Journal of Forest Science and Practice*, 9 (82):
9. Štípán, L.; Křivanová, M. 2000: *Work and life of millers and millwrights in Bohemia* [Czech]. Prague: Argo, p. 7 – 130. ISBN 80-7203-254-2
10. ***2008: Considerable impact of long-term problems in state forests on sawmill production. In *Truhlářské Listy*, 12 (16): 42-46.
11. Federation of wood-working corporations in the Czech Republic: 1971
12. ***<http://www.pilavystrkov.cz/historie.php> [cited 2009-02-17]

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