

*Full Length Research Paper*

# Solid wood flooring and multilayered parquet industries in Turkey

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**Status problems and solution proposals of Turkish solid wood flooring and multilayered parquet industries between 2002 - 2006 was analyzed due to necessity for investigating developments after 2002 in this study. As the result of solid wood flooring inquiry study, most frequently used native and exotic species in production were determined as oak, beech, red pine, sapele, iroko respectively. Dry kilns were designated mostly modern and automatically controlled. But steaming technology was determined to be insufficient because of incapable temperature measurement and control system. Average yield in producing flooring strips from log and in producing wood parquet from flooring strip were determined as 61.7 and 70.4% respectively. Most enterprises apply TS 73 EN 13226 (2004) in classification. As the result of multilayered parquet questionnaires, native species used in lamella (top layer) production are oak, beech, walnut, maple, cherry, ash; and exotic species are iroko, sapele, merbau, doussie, teak, wenge, bubinga. Machines producing flooring strips from logs and lamella production machines vary from mostly modern and to rarely out of date in Turkey. Thin cutting frame saws frequently used in top layer production from flooring strips have superior technology. Dry kilns are also modern. Lacquer is cured by means of UV system in ultraviolet curing tunnels. Average yield in producing flooring strips from lumber was found 60 %. Most multilayered parquet enterprises apply TS EN 13489 (2004) in classification.**

**Key words:** Solid wood flooring industry, multilayered parquet industry.

## INTRODUCTION

Various periods were seen in Turkish parquet industry structural situation since 1934 whether status of this industry branch was looked over from past to present. Being informed about industrial structure of these periods and comparing obtained existing status with previous periods are important to guide enterprises for determining their targets, policy for future and plan their business. The Belgian Firm Zingal, first parquet enterprise which was located in Ayancık-Turkey, started production in 1934 (Kantay R, Ekizoglu, 1988). Status, problems and solution proposals of Turkish solid wood parquet industry between 1935-2002 were investigated in previous articles (Gungor, 2008). Kantay et al. (1989) stated that the basic problems were about raw material, marketing, manufacturing technology and others. Other problems were sum-

marized as follows; a) insufficient statistical datas were obtained about parquet industry b) occupational cooperation was determined not to be taken into consideration in this industry branch c) incapable relationships between scientific institutions and industry establishments d) information shortage about parquet usage and care. Solution proposals to these problems were stated as follows; a) an organization has to be established to solve parquet industry problems and constitute relations between scientific institutions and industry establishments b) instructions for parquet application have to be taken into consideration for convenient usage. Problems, solution proposals for parquet industry was studied by Kantay (1998) in another study. In this study it was determined that basic problems were about difficulty in raw material supply and manufacturing technology similar to problems stated at Kantay et al. (1989). Also no adequate service was determined to be given about parquet maintenance and care. Solution proposals to problems were stated as follows; a) Since problems about

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manufacturing technology were determined, technologically insufficient dry kilns were considered to be modernized b) sufficient service has to be given about parquet maintenance and care. Turkish parquet industry was researched by Kantay (2002) in another study. It was determined that Turkish parquet industry involves solid wood parquet, multilayered parquet and laminated parquet industries. Also it was stated that earthquakes in Turkey in 1999, TL- foreign exchange unbalance and economic crisis in 2001 constituted problems about parquet industry similar to other industry branches.

## MATERIALS AND METHODS

Inquiry study was conducted for determining general situation about technological structure, yield and quality characteristics of Turkish solid wood flooring and multilayered parquet industries. At first, two types of inquiries for both solid wood flooring and multilayered parquet industries were prepared, then directed to manufacturers by 2006. Inquiry applied enterprises were determined by the target of reaching total amount. In this respect, lists taken from parquet machinery manufacturers, occupation establishment registrations, fair booklets, catalogs and information obtained from internet were used. As result, 33 solid wood flooring and 4 multilayered parquet enterprises were determined (Gungor, 2008).

Study was first planned to be conducted by means of face to face inquiry method. At first, it was possible to carry out that, but then this method couldn't be applied. Because some participant enterprises didn't accept face to face inquiry. So some inquiries were sent by cargo. Inquiries which are formed in systematic structure consist of 37 questions for solid wood parquet and 50 questions for multilayered parquet. Answers were taken from manufacturing engineers or enterprise owners. 28 enterprises of 33 accepted to answer inquiries. For multilayered parquet industry, total amount of 4 enterprises answered inquiry. Inquiry participation of enterprises was determined 84.85 and 100% for solid wood flooring and multilayered parquet, respectively. Questions taking part in both solid wood flooring and multilayered parquet inquiries can be grouped in 7 main headlines such as; questions about (1) firm identification and structural characteristics, (2) raw material, (3) manufacturing and marketing, (4) manufacturing technology, (5) yield and loss, (6) quality characteristics, (7) a) determining expected situation of solid wood parquet industry in future b) obtaining information about existing situation of multilayered parquet industry (Gungor, 2008).

Solid wood flooring inquiry datas were evaluated statistically by SPSS. Main reason for choosing SPSS in forest products industry inquiry evaluation is that it gives opportunity for using same datas for various different tests (Aksu et al., 2002; Kurtoglu et al., 2004).

## RESULTS AND DISCUSSION

Situation of solid wood flooring and multilayered parquet industries were revealed in the following headlines.

### Solid wood flooring industry situation

**Structural characteristics of solid wood flooring industry:** Enterprise distribution according to establishment area was observed. As a result, it was determined

that 21.4, 14.3 and 10.7% of enterprises were located in Istanbul, Duzce, Sakarya; respectively at Western Black Sea and Marmara regions of Turkey. Reasons for establishing big amount of enterprises in these cities can be expressed as follows; (1) mentioned cities are located near sea or sea transport, (2) stated destinations are situated appropriately for raw material supplies.

50, 28.6 and 21.4% of enterprises were determined to be limited, incorporated and individual firm; respectively. Similar results were obtained from researches by Colakoglu (2004) and Erdinler (2005). Colakoglu (2004) determined 26.5, 45 and 28% of solid wood parquet enterprises as incorporated, limited, other legal stated; respectively (Colakoglu, 2004). According to another research on large scaled enterprises of Turkish forest furniture industry in Marmara region, Erdinler (2005) stated that most enterprises were limited and incorporated companies as a ratio of 52.4 and 41.3% respectively (Erdinler, 2005). As the result of our survey; 84% of solid wood parquet enterprises were found to be integrated with lumber enterprises in Turkey. 35.7, 32.1, 17.9 and 14.3% of enterprises were established between the year 1981 - 1990, 1991 - 2000, 1971 - 1980, 1950 - 1960 respectively. No enterprise was determined to be established after 2001 by the way. Kantay (2002) stated that earthquake in 1999, Turkish money "TL"- foreign exchange unbalanceness in 2000 and economic crisis in 2001 were reasons for not establishing enterprises after 2001 in Turkey. Also big amount of demand to PVC, linolium and especially to laminate floor coverage, known as alternative cheap floor coverage materials, can be another reason for not establishing enterprises.

Big amount of enterprises were found to be small scaled; and 8.7 % of enterprises were determined to be very small scaled according to TUIK (Turkish Statistic Association) company scale classification by means of employed workers number. TUIK, 1997 classified company scales according to employed workers such as; very small scaled (1 - 9 workers), small scaled (10 - 49 workers), middle scaled (50 - 149 workers), large scaled (more than 150 workers).

Big amount as 63% of enterprises don't have any investment plans about increasing capacity and existing activities. Investment planning enterprises have mostly technology improving plans; as ratio of 50:25% of investment planning enterprises have investment plans about increasing production volume. Enterprises which don't have investment plans give reasons for not having plans such as; (1) consumers preference PVC, linolium, especially laminate floor coverings instead of solid wood flooring, (2) increasing manufacturing costs in solid parquet enterprises.

Capacity usage ratio is low; as ratio of 49.75% for solid wood flooring industry. Demand quantity inadequacy was determined to be related with small capacity usage ratio. Other reason for having small capacity usage ratio was found to be raw material quantity inadequacy. Amount of

enterprises having membership in occupational organizations; such as PARSIAD (Turkey Parquet Industry Businessman Society), Lumber Society, Wood Association are little. This indicates that occupational association are not considered to be important in this industry branch.

**Raw material situation in solid wood flooring enterprises:** Oak, beech, red pine are widely used home-grown species in manufacturing; used as 50, 21.4 and 21.4% respectively. Exotic species mostly used in manufacturing are sapele and iroko. As raw material, 43.5% of timber is obtained from forest administration market sales. Imported timber can be supplied in two ways, such as (a) by means of a merchant, (b) company's foreign relations. Main problem for supplying raw material is difficulty in obtaining high quality and sufficient amount of timber.

**Production and marketing in solid wood flooring industry:** Solid wood flooring production was determined to be 2.000.000 m<sup>2</sup> per year averagely between 2001 - 2006 in Turkey. Mostly used marketing methods are directly sale from company with 50%; sales from stores with 22.2:53.8% of enterprises don't have problems about marketing. Frequently seen problems are competition conditions of enterprises against alternative cheaper floor coverage material suppliers, stagnant in markets and cash problems. 62.5% of enterprises don't have export. Frequently produced parquet thickness is 16 mm with a ratio of 60.7%. Enterprises were determined to try producing parquet thicknesses, with accordance to Anon (2004a). Problems mostly seen in production are limited market conditions, financial problems, obtaining sufficient amount and high quality raw material.

**Manufacturing technology in solid wood flooring industry:** 75.8% of enterprises are manufacturing parquet blocks in their own company. 89.3% of these enterprises are manufacturing parquet blocks from timber. 10.7% of them are manufacturing parquet blocks from purchased lumber. For block production and timber sawing, log belt-saw, log circular saw, log frame saw are used in ratios as 24.8, 7.9 and 4% respectively. Band-resaw is used with a big ratio of 18.8% for sawing slabs and thick lumber. Firms using elementary technology and modern technology can be seen in this industry branch. Enterprises apply firstly air-drying and then kiln drying method for drying parquet material. 96.2% of enterprises apply classic drying method among technical drying methods. 85.2% of enterprises can control drying conditions. Enterprises use manual and automatic drying control methods with 42.3 and 30.8% respectively. 67.9% of enterprises have steaming chambers; but their technology is insufficient.

**Yield in solid wood flooring industry:** Timber class and log class are known to be important for parquet blocks manufacturing. As timber quality decreases, yield also

decreases. Average yield in manufacturing parquet block from log is 61.7%. Main reason for decreasing yield is log features. Others are workers non-qualification and high quality product demand. Ready to use blocks are bought and sawed in some enterprises. Average yield in producing solid wood parquet from parquet block was found to be 70.4%. Factors affecting yield in this step is parquet block quality with percent of 53.3; others are drying defects in blocks, allowances for drying, edges, workers qualification.

**Quality in solid wood flooring industry:** Anon (2004a) is used in solid wood flooring classification in Turkey since 2004. % 59.3 of enterprises applies this standard in manufacturing and classification. Mostly produced parquet class is second class with 39.3% in Turkey, accordance to Anon (2004a). First class and third class parquets were found to be produced with similar amounts. None of enterprises were found to be involved in quality assurance system. 57.7% of enterprises don't have clear opinion about competition with European Union countries.

**Solid wood flooring industry's future:** Decreasing of solid wood flooring production has been seen in Turkey because of various reasons since the beginning of 2000. Producer opinions were tried to be taken about reasons for this. And reasons were summarized as follows; (1) presenting laminate floor coverage material in markets with very alluring prices, (2) high raw material costs in solid parquet manufacturing. Presented proposals of manufacturers for increasing solid wood flooring demand are as follows: (1) Understanding of alternative floor coverage materials usage disadvantages can increase demand. (2) Informing consumers for not choosing artificial floor coverage materials because of their disadvantages such as health problems is found to be useful. (3) Parquet installers participating in an association and taking sufficient education in order to prevent mistakes in installation and finishing can increase demand. (4) Manufacturing with accordance to Anon (2004a) can result with high quality and big amount of demand. (5) Presenting finished solid wood flooring to market can increase demand due to easy installation wishes of customers. (6) Decreasing manufacturing costs and applying on time product delivery policy can cause demand increases.

### **Multilayered parquet industry situation**

**Structural characteristics of multilayered parquet industry:** Four multilayered parquet enterprises were found to be in activity by 2006 in Turkey. Two of them are located in Duzce, other two enterprises are located in Adapazari and Kocaeli. These cities are located in Marmara and Western Black sea regions of Turkey where transportation facilities and raw material supply can take

place easily. Three enterprises are incorporated, the other is limited company. Two multilayered parquet enterprises are integrated; one with lumber, other with solid wood flooring. Multilayered parquet production started in 1998 and 1999 in these integrated firms. According to TUIK previously mentioned, two enterprises are medium scaled and one enterprise is large scaled. Most of technical employee are usually qualified technicians graduated from furniture and decoration programs, others are engineers. Three enterprises were found to have investment plans for improving technology and production lines related with increasing capacity. Enterprises weren't determined to participate in organizations. Occupational organization would thought to be understood whether new enterprises participate.

**Raw material situation in multilayered parquet enterprises:** Oak, beech, walnut, maple, cherry as home-grown species and iroko, sapele, merbau, doussie, teak, wenge, bubinga as exotic trees were determined to be used for top layer production. Common features of these species are having esthetic advantages. Top layer obtaining methods were searched and all enterprises declared that they manufacture top layer in their firm from parquet blocks or logs or both from parquet blocks and lumber. Two enterprises were determined to use birch and ozigo plywood, others were found to use spruce and fir solid wood, time to time changeable fir solid wood or birch plywood for core and bottom layers. Existing problems in raw material supply were found to be high prices and difficulties in finding high quality material.

**Production and marketing in multilayered parquet industry:** Frequently preferred marketing method was determined as marketing by means of sale stores. Manufacturing problems were found to be mostly related with raw material and limited market conditions.

**Manufacturing technology in multilayered parquet industry:** In competing firm's arena, enterprises mostly prefer to save production details as secret. As a result, no detailed information about manufacturing details was obtained. But above all this, some general information could be determined. Enterprises were found to produce lamella blocks in their own firm or obtain them ready. Lamella production from blocks is materialized in enterprises. Some enterprises were found to buy either green lumber or dried lumber; and convert them to lamella blocks. Others were determined to buy green lamella blocks or dried lamella blocks. Most enterprises stated that they use thin cutting frame saws and parallel planning machines. Enterprises using green parquetry lumber or green lamella block stated that first they air dry them, then apply kiln drying. Most enterprises were found that they use classic drying. All enterprises were determined to control drying conditions. Enterprises usually prefer to use urea formaldehyde resin for forming

raw unprofiled parquets and don't have any gluing problems. Varnish using in finishing lines is mostly poliuretane. Automatic belt- buffing machines and drum buffing machines are mostly used in finishing lines. Varnish drying is usually applied by UV rays.

**Yield in multilayered parquet industry:** Enterprises mostly manufacture 4 mm thickness lamellas. Yield in lamella blocks manufacturing from lumber was found to be 60%.

**Quality in multilayered parquet industry:** Turkish Standardization Association accept the standart Anon (2004b) "Wood Flooring Elements Multilayered Parquet Elements" for classification of multilayered parquets. Most enterprises apply Anon (2004b) in classification. All enterprises were found to apply different methods for insuring quality guarantee; mostly with measurement and control cards used in certain manufacturing steps. Most enterprises declared that they don't have any idea about competition level with European Union countries.

**Multilayered parquet industry situation recently:** Most enterprises stated that they prefer to produce multilayered parquet because of its technical advantages and big quantity of demand. Enterprises stated reasons for expecting big quantity multilayered parquet demand in the future. These reasons can be declared as follows; (1) It is made of natural material (2) Its esthetic appearance attracts customers (3) Installing applications can be materialized easily.

## Conclusion

Proposals for Turkish solid wood flooring industry can be summarized as follows. Importance of employing enough technical employees has to be understood by solid wood parquet enterprise owners. Consumers should be informed about disadvantages of using cheap floor coverage materials such as PVC, linolium, etc for increasing solid wood parquet demand quantities. Also a trend towards rustic look for hardwood floors making by machine-distressing and wire- brushing can cause demand increases due to customer esthetic preferences as mentioned by Al S. Enterprises should be a member of a career (professional) association such as Turkish Parquet Sector Industry and Businesspeople Association (PARSIAD) for the purpose of constituting solidarity and reaching solutions about common problems within sector members. According to our country's forestry; raw material can be presented to sales in definite periods. So all precautions have to be considered for the purpose of raw material storage without quality loss. Installation problems that take away customers from preferring solid wood parquet as floor coverage material have to be eliminated. Convenient finishing systems have to be

applied according to usage area conditions (Kurtoglu and Unligil, 1991). Appropriate steaming conditions can be applied in temperature and relative humidity controlled steaming chambers (Kantay, 1993). Since temperature measurement and relative humidity control can not be applied in steaming at enterprises, steaming chambers should be modernized. Enterprises have to conduct projects for applying quality guarantee and total quality understanding has to be assumed. Gungor and Sofuoglu (2004) stated that quality tests have to be applied by means of international standards and products should be certificated.

Proposals for multilayered parquet industry can be summarized as follows. This industry branch has been growing steadily in Turkey recently due to big amount demands and superior technical properties of products. Technical properties of multilayered parquet which gained popularity in New Zealand were also discussed by Jones (2003). Jones (2003) stated that these technical features cause advantages such as quick installation and can be taken away and relaid when moving house. Also McMillan (1993) expressed advantages of prefinished flooring systems. As result of this study, it was determined that this flooring system can be applied right over an existing floor, whether it's wood, concrete, vinyl or ceramic tile. New enterprises have been thought in Turkey recently. But these enterprises would be successful with analyzing and understanding manufacturing details. Enterprises should be a member of career (professional) association such as PARSIAD. Using high quality raw material in top layer manufacturing can increase enterprises competition power and market share due to superior quality product manufacturing. Automatic through-feed press was determined to be convenient for multilayer parquet production line because of its high productivity, having no risk for early glue catalization and having options as dimensional control station and line control system. Using technologically advanced finishing line and convenient coatings were found to be important for high quality surface property. Anonymous (2006) also stated that adding aluminium-oxide powder to urethane coatings in finishing line make prefinished parquet more durable. Blanchet et al. (2003) found that varnish layer plays an important role in the performance of engineered wood flooring by reducing cupping distortion by 50 percent since it limits moisture adsorption through the surface layer.

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