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QUALITY INFRASTRUCTURE FOR FURNITURE TESTING IN BOSNIA & HERZEGOVINA

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Abstract

This paper presents the activities of newly established and accredited Laboratory for testing furniture and wood - LIND in Bosnia and Herzegovina. The laboratory was established within an EU project, and now it offers services to wood industry in Bosnia and Herzegovina. The first tests performed by this laboratory showed that there is a lot of space for improvements in furniture design and production, and also showed that the quality of imported furniture is unexpectedly low, despite the common opinion on high-quality of imported products. The paper shows a few examples of furniture tests performed, the test results and recommendations for future laboratory and infrastructure development.

Introduction

Wood industry in Bosnia and Herzegovina (BH) in 2014 achieved total exports worth more than a billion KM, or 11% share in the total BH exports, and an increase of 10 percent compared to 2013, despite the difficulties on economic affairs faced by BH and neighbouring countries. It is important that BH manufacturers will turn to the quality of their products, innovation and design. Local Economic Development Agency in Zenica has been realizing improvement activities in the field of quality testing for the removal of barriers to export-oriented companies. The Laboratory for testing furniture and wood - LIND operates under the auspices of this agency. It is the only accredited laboratory of its kind in BH, and it has been established as part of the project supported by the European Union. Most of the furniture produced in BH is made of wood, and this is one of the industries with biggest export potential. The only obstacle is certified quality required by EU and other markets. This laboratory early showed its competence to perform the testing and certification of furniture, thus improving the quality infrastructure in Bosnia and Herzegovina.

Zenica Economic Development Agency ZEDA in 2010 received a grant from the Delegation of the European Union to Bosnia and Herzegovina for implementation of the project MENTOR (*Modern Economy through New Technology-Oriented Research*). The most important task was to establish a laboratory for testing furniture, and its accreditation to operate in accordance with European standards in this area. Co-founders of the project were: Regional Development Agency, Federal Ministry of Entrepreneurship and the Government of Zenica-Doboj Canton. In addition to these funds, the city has invested 0.5 million EUR in renovating the Techno park building in which the laboratory is located. Machinery and equipment were purchased from suppliers from German company "Hegewald & Peschke GmbH".



Fig. 1. Laboratory for testing furniture and wood LIND

Source: own research

The laboratory was officially opened in November 2012, and it was accredited in October 2013 according to EN ISO/IEC 17025 by the Institute for Accreditation of Bosnia and Herzegovina BATA, which is a signatory to the bilateral agreement with the European Accreditation (EA). The laboratory staff established a quality management system according to the requirements of

Bosnian and European standards that define methods of furniture testing (chairs, tables, wardrobes, drawers, cabinets, etc.).

Fourteen (14) standards for different types of static, dynamic and functional testing of products are already accredited, and machines and equipment in the laboratory enable performance testing according to additional 23 standards.



Fig. 2. Testing chair durability
Source: own research

1. Literature review

The report made for EU in 2014 stated that the constant progress in the quality of products from foreign countries could eventually lead competition out of a pure price matter. The fact that the EU exports high quality components and machinery may accelerate this trend in the medium term. Existing product, environmental and health & safety regulation applicable in the EU are comparatively stricter (and more costly to comply with) than those found in emerging markets¹.

¹ Tomaselli A.R., Tracogna A., Zavatta R., Bolognini A. *The EU Furniture Market Situation and a Possible Furniture Products Initiative*. Final Report submitted to the European Commission DG Enterprise and Industry. Brussels, November 2014.

Chinese authors published a number of papers about the role of furniture testing for improvement of export-oriented manufacturing, and about development of new performance tests in furniture quality testing².

As opposed to construction elements (doors, windows), furniture is not subject of certification when it is produced solely for national market. Export products, on the other side, are often required to pass a series of tests and to fulfil requirements prescribed by directives, especially when they are placed on EU market³. However, furniture for special purposes, such as furniture for healthcare service institutions, is required to pass much stricter requirements⁴.

Choodoung and Smutkupt studied designer's consideration factors that affect function and production of furniture⁵. The study result indicates that such factors are design process (planning for design, product specifications, concept design, product architecture, industrial design, production), design evaluation as well as wooden furniture design dependent factors i.e. art (art style; furniture history, form), functionality (the strength and durability, area place, using), material (appropriate to function, wood mechanical properties), joints, cost, safety, and social responsibility. Their study was performed on a dining armchair as a case study with all involving factors and all design process.

Boon-Kwee and Thiruchelvam analysed Malaysian wooden furniture industry, which has some similarities with Bosnian industry. It is a low-tech, labour intensive and supplier-dominated industry, and its pattern of innovation is widely acknowledged as business driven⁶. They ascertained the roles played by the various innovation actors and their linkages to the process of technological innovations in the wooden furniture industry. The main findings from this study indicate that the dynamics of innovation in Malaysia's wooden furniture industry are mainly business-led and are characterised as collective innovation. In this regard, the roles played by the immediate business environment such as suppliers, customers, competitors, and retailers are of paramount importance. These

² Xiongfei L., Fenghu W. *Mechanics Performance Testing of Armchair in Furniture Quality Testing*. Journal of Northeast Forestry University. 2012-08

³ Virgil G. *Integrated Installation Systems Used For A Joinery And Furniture Testing Laboratory With A View To The Quality Certification*. 14th International Research/Expert Conference TMT 2010. Mediterranean Cruise. 11-18 September 2010

⁴ Malone E.B., Dellinger B.A. *Furniture Design Features and Healthcare Outcomes*. The Center for Health Design. 2011.

⁵ Choodoung S., Smutkupt U. *Factors of Successful Wooden Furniture Design Process*. International Scholarly and Scientific Research & Innovation 6(10) 2012. p. 540-544

⁶ Boon-Kwee Ng, Thiruchelvam K. *The dynamics of innovation in Malaysia's wooden furniture industry: Innovation actors and linkages*. Forest Policy and Economics, 14(1). 2012. p 107-118. <http://dx.doi.org/10.1016/j.forpol.2011.08.011>.

innovation actors have been linked closely to firms in their surge for technological advancement.

Prekrat et al. investigated the possibility of shortening the testing procedure of final products and evaluate the quality of final products by segment testing of components in the design phase⁷. They opened the possibility of a new, different approach to testing the strength of constructions, using methods for testing assemblies instead of entire final products in accordance with the applicable standard working methods.

2. Classroom desk

The first example of furniture testing presented here is the classroom desk (fig. 2) manufactured by one Bosnian company. The test was initiated by the manufacturer, in order to confirm the requirements set by EU-based customer. Table top is made of laminated particleboard, metal legs construction consists of Ø40 mm round tube, 20x40 mm rectangular tube and Ø6 mm metal hooks.

The desk was tested according to two standards: BAS EN 1729-1:2009⁸ and BAS EN 1729-2:2013⁹. The desk satisfied all of the functional requirements of these two standards. The test showed not only the high quality of the product, but also provided the local company with necessary exporting documentation.

3. PVC outdoor chair

The second example is testing of PVC outdoor chair (fig. 3), initiated by the Market surveillance agency of Bosnia and Herzegovina. The product was manufactured in Italy and sold by a local trade company.

The chair was tested according to standards BAS EN 581-2:2010¹⁰, BAS EN 1022:2009¹¹ and BAS EN 1728:2005¹². The product failed 7 out of 9 requirements of these standards. Total number of eleven different chair models

⁷ Prekrat S., Smardzewski J., Brezović M., Pervan S., *Quality of Corner Joints of Beech Chairs under Load*. *Drvna industrija* 63(3). 2012.

⁸ BAS EN 1729-1:2009 (EN 1729-1:2006) *Furniture. Chairs and tables for educational institutions. Functional dimensions*

⁹ BAS EN 1729-2:2013 (EN 1729-2:2012) *Furniture. Chairs and tables for educational institutions. Safety requirements and test methods*

¹⁰ BAS EN 581-2:2010 (EN 581-2:2009) *Outdoor furniture. Seating and tables for camping, domestic and contract use. Mechanical safety requirements and test methods for seating.*

¹¹ BAS EN 1022:2009 (EN 1022:2005) *Domestic furniture- Seating - Determination of stability.*

¹² BAS EN 1728:2005 (EN 1728:2001) *Domestic furniture. Seating. Test methods for the determination of strength and durability.*

was subjected to tests, and only 2 products satisfied the requirements. The models which failed the tests were withdrawn from the market afterwards.



Fig. 2. Classroom desk
Source: own research



Fig. 3. PVC outdoor chair
Source: own research

4. Aluminium outdoor chair

The third example is testing of aluminium outdoor chair (fig. 4), also initiated by the Market surveillance agency of Bosnia and Herzegovina. The product was manufactured in China and sold by a Croatian trade company.

The product declaration stated that the chair satisfied the conditions of Croatian national rule NN 63/95 and standard HRN D.E2. These requirements were allegedly met as follows: durability (basic level - QIII), surface resistance (high level QII) and material quality (basic level QIII). Although these tests were performed by an accredited laboratory in Croatia, after customer complaints the Agency suspected that products could be faulty, and asked for additional testing at our laboratory. We have to mention that this Croatian standard is older and less demanding than the European standard we used for testing.

We tested the product sample according to standards BAS EN 581-2:2010¹³, BAS EN 1022:2009¹⁴ and BAS EN 1728:2005¹⁵. Although the standard required testing of seat and back fatigue in 25.000 cycles, after 19.368 cycles we noticed the failure of the riveted joint (fig. 5). The product failed 2 out of 9 tests, and it was consequently withdrawn from the market.



Fig. 4. Aluminium outdoor chair
Source: own research



Fig. 5. Failed riveted joint
Source: own research

Conclusions

Modern global market brought additional demands in front of furniture manufacturers in terms of low price, high quality and unfair competition. Although it is common opinion that products from emerging markets are usually low in quality, and that EU-originated products are superior in quality, thus justifying the higher prices, this case study showed that this is only a prejudice.

The laboratory tests performed according to the Bosnian and European standards in an accredited laboratory outside the EU showed that it is not enough

¹³ BAS EN 581-2:2010 (EN 581-2:2009) *Outdoor furniture. Seating and tables for camping, domestic and contract use. Mechanical safety requirements and test methods for seating.*

¹⁴ BAS EN 1022:2009 (EN 1022:2005) *Domestic furniture- Seating - Determination of stability.*

¹⁵ BAS EN 1728:2005 (EN 1728:2001) *Domestic furniture. Seating. Test methods for the determination of strength and durability.*

to have the product manufactured in EU, or even tested and certified in EU. Additional tests can reveal faulty products regardless of the product origin.

In order to perform such tests, it is necessary to have the appropriate quality infrastructure, including institutions, regulations, accredited laboratories, legislation, international agreements, well-educated human resources, and finally the established and (preferably) certified quality management systems. Only such an infrastructure guarantees the products which are safe, reliable and which fulfil its function. However, the establishment of such an infrastructure is costly, and requires strategic planning and allocation of resources.

The laboratory presented in this paper is only small portion of a future national quality infrastructure, which should enable Bosnia and Herzegovina to enter the demanding European market.

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