

Safety guidelines of the early phases of timber processing

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Abstract

Over the last decade workers' health and safety have been given a growing attention and the laws issued in Italy to protect and improve both workers' health and work standards are intended to avoid, or at least contain, occupational hazards and diseases. Now, in view of the very important role of the timber sector within the Italian economy and particularly of the Calabria Region, and in consideration of the crucial issues linked to workplace safety in this same sector, it was decided to carry out a comprehensive assessment of the hazards related to timber processing in a sample of nine timber processing businesses. The main objectives of the study were: i) defining risk profiles in the sector under consideration, and ii) formulating technical proposals and fixes targeted to risk reduction. The study has in addition assessed both sanitation and environmental conditions for all the workers. The survey has highlighted a rather serious situation, in terms of work safety conditions, of the sector of timber processing. The results obtained do suggest that additional research efforts and targeted worker's training are required to improve safety conditions in timber processing businesses safety, in particular should become a sort of discipline in daily business operations.

Keywords: safety, timber processing.

Introduction

Over the last decade, workers' health and safety have been given a growing attention as shown by the laws passed by the Italian Government in this same period which are primarily intended to avoid – or at least contain – work hazards and disease. The data collected by the Agencies confirm that timber processing is an activity with high risk in terms of hazard occurrence (INAIL, Italian Workers' Compensation Authority, 2003). This is also ascribable to the fact that the production chain in question still includes many hand-made processing phases, which imply direct exposure of workers to work environment risk factors (equipment, machines and materials). This exposure results from a closer and more continuous contact with dangerous equipment compared to other sectors (Table 1). The aim of the present study has been to address the need to deal with issues related to the safety of the equipment used in primary timber processing, including the regulations presently in force in this sector, as well as the analysis of the risks related to this productive activity.

The study has been conducted in Calabria, one of the most important Italian regions in terms of timber production with an annual amount of processed timber of 828,395 m³, i.e. 9% of the national amount and 34% of the total amount of timber processed in southern Italy. As to the typology of wood products produced, Calabria is one of the largest producers of sawn timber, ply-wood, beams and poles (ISTAT, 2006). Given the great economic importance of the Calabria wood sector and in view of the problems related to the work conditions of this sector, it has been decided to start from the assessment of the risks (on the basis of the laws currently in force) correlated to the production processes carried out in nine sawmills considered to be a representative sample of the entire regional sector.

Timber processing encompasses a number of different kinds of processes which are almost always characterized by an elevated level of automation. In spite of this, many businesses, also because of the low added value of the finished product, still rely on obsolete equipment and machines which, while still keeping a pretty good level of productivity, are likely to create many problems and jeopardize both the safety and the health of the workers (Zimbalatti *et al.*, 2007).

Table 1. Activity sectors: occupational hazard

Sector of economic activity	Index of frequency (*)				
	Temporary disability	Permanent disability	Death rate	Total	Index number
Metal processing	65.79	2.47	0.08	68.34	191.2
Non-metallic minerals	63.86	2.64	0.12	66.61	186.4
Timber processing	58.51	4.13	0.06	62.70	175.4
Construction	54.43	4.10	0.19	58.72	164.3
Industry and Services (combined)	34.19	1.49	0.06	35.74	100.0

(*) Accidents indemnified per 1,000 covered by INAIL (Italian Workers' Compensation Authority)

Methodology

Starting from the provisions contained in the laws presently in force in this sector, the present study was meant to analyze the risks correlated to production operations in nine sawmills considered to be a reliable sample of the entire sector of the Calabria region. Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat. The primary goal of the research effort, has been that of identifying risk profiles to be used as a background for the detection of specific technical fixes, intended to reduce the risk assessed for each one of the operations to be carried out (guidelines). The assessment of risks, has been carried out relying on a semi-quantitative criterion given by multiplying hazard likelihood (**P**) by the severity of damage (**D**). These two parameters had previously been given a "subjective score" on an 1 to 4 scale (Novello M. and Dallasega F., 2003). Under this subjective score system, a score of 1 for the parameter "**hazard likelihood**" meant a rare event, whereas a score of 4 was associated to a very frequent event. As to the parameter "**severity of damage**", a score of 1 was associated to mild traumas, whereas a score of 4 was associated to serious injuries.

The extent of the risk of accident has therefore been assessed by the construction of the matrix of the products:

$$\text{Risk} = \mathbf{P} \times \mathbf{D}$$

The application of such a procedure has allowed to define 3 classes of risk: **mild**, **average**, **high** (Figure 1). Within this framework, both hazard risks and health risks were taken into consideration (*physical, chemical and biological agents, difficult working conditions, work organization*).

As to the assessment of the risks of exposure, the study has envisaged a specific survey sheet containing a specific checklist of checkpoints meant to collect three kinds of data:

- Description of the work (*hand-made, mechanized, etc.*);
- Detection of potential risks and resulting damage (*source and typology of risk, risk-damage correlation*);
- Risk assessment (*outcome of the survey in a scale of risk and priorities*).

Hazard Likelihood					
Highly Likely 4	4	8	12	16	
Likely 3	3	6	9	12	
Poorly Likely 2	2	4	6	8	
Unlikely 1	1	2	3	4	
Reference Scale	1 Mild	2 Medium	3 Serious	4 Very serious	Severity of Damage

Figure 1. Matrix for Risk Assessment (R = P x D)

The first phase of the work in question was meant to explore and learn the provisions contained in the laws presently in force on farm work safety. This made it possible to detect the specific risks of timber processing. In more detail, the above survey form was set up of each and any phase of the processing cycle and supply chain highlighting the peculiar nature of the operations carried out by operators (specific risk). In addition, the above operations were described synthetically to be ranked according to specific level of mechanization of each infield operation. The selection of the nine sawmills (designated by alphabet letters from A to I) deemed to be a representative sample for the present study, has been based on two parameters: i) their geographic location and ii) the different milling processes carried out within them (Warensjö M., 1997). Nevertheless the sawmills selected differed in terms of size, type of timber processed and of wood products, number of workers, productive processes and machines (Table 2). The study has in addition focused on both business management aspects and workers' behaviour during the different processing phases for which also the number of workers involved has been assessed. After analyzing the many cropping operations required in timber processing, some specific records were devised to indicate the appropriate safety measures for each cropping operation in a view to determining present risks, potential damage, safety guidelines and containment measures to prevent the risks assessed. The records for the assessment of specific risks were worked out for each operation in order to highlight all the details of the different phases (Clavel P., 2003).

Results

The sawmills under study had an average annual production of 2.560 m³ wood products. The timber usually process comes from the provincial area (68%), from the other provinces of the Calabria Region (20%), and from both national and international markets (12%). In particular, all sawmills studied use to buy long stems which are then cut in to sawlogs by means of cross-cutting. Softwood sawlogs have an average length of about 4 m, whereas

hardwood sawlogs are on average 3 m long. The wood products fall within three categories: carpentry and construction materials, semi-finished products to be additionally processed and products for packing and boxing (Zimbalatti *et al.*, 2005).

At the end of the surveying and data processing phase, 21 technical sheets have been drawn up which are intended to summarize the specific occupational risks observed and assessed as well as the guidelines to be followed to prevent, or at least contain, the risks of the individual processing phases. A synthesis of the main aspects highlighted in the different phases of processing is given below. For the sake of synthesis, the assessment of risk in "limit cases" observed has been prioritized disregarding low-profile risk situations (Table 3).

Table 2. Features of sawmills studied

	Number of workers	Timber volume (m ³ /year)	Species of wood	Products	Workforce (days/year)
A	5	900	Chestnut, beech, poplar	Carpentry and packing timber	210
B	9	4.000	Corsican pine, Silver fir	Trusses, semi-finished products	250
C	8	3.000	Chestnut, beech	Semi-finished and carpentry timber	245
D	6	1.100	Corsican pine, Silver fir	Carpentry timber	215
E	11	7.000	Chestnut, Silver fir	Semi-finished for furnishings, pallets, carpentry	275
F	7	2.600	Corsican pine, beech	Carpentry timber	230
G	8	2.000	Chestnut, Silver fir	Semi-finished for furnishings and standing finishes, pallets	220
H	6	700	Beech, Silver fir	Semi-finished for furnishings and standing finishes	205
I	7	1.800	Corsican pine, beech	Packing timber, pallets	225

a. Logs handling

Workers moving across the stacks of logs can happen to be accidentally in contact with log protruding parts; log moving machines can hit the workers in the log handling area. There is a high risk of fall and/or rolling down of the logs from atop stacks, which can be either ascribed to mistakes made by the drivers of the machines or result from load instability when piling up the logs. The assessment of the risks connected to these operations for the labourers under study, led us to define this risk as **likely** with a **mild** damage (R3.5: average). The guidelines proposed suggest a greater use of mechanical checks, as well as a constant use of PPE and of transit paths for clean enough operations.

b. Barking

The possibility does exist for workers to run into trunks in motion or in machine operating mechanisms due to either a poor keeping of the machines in question, or to the projection of splinters during barking operations. Noise and dusts are produced by the

operation of barkers, which “remove” the bark very rapidly by means of rotating blades and release elevated levels of dusts and noise “polluting” the area around. The hazard risk detected for the 67 labourers of the 9 sawmill under study involved in this phase can be defined as a **high** risk followed by a **mild** damage (R5.5: average). The guidelines formulated focus essentially on a high level of training of the labourers involved, accompanied by constant use of Personal Protective Equipment (PPE). Employers should in this case emphasize the importance of keeping a right posture during these operations, which should also be supplemented with compensation physical exercise, if needed.

c. Logs cutting

In addition to the above risks, which result from elevated levels of noise levels and dusts, also microclimate conditions are important for human health, especially in the sawing areas and when machine drivers are not protected by a cab. In this case the risk has to do with the uncomfortable temperatures that can be reached, especially in wintertime. Therefore risk containment measures adopted by the employer and implemented by the labourers are of crucial importance. This also highlights the importance of an efficient use of those devices meant to reduce at most exposure to wood dusts, noise and repeated movements. Such hazard risk, defined as **likely** with **medium** damage (R7: average-high)

d. Board cutting

In this case the possibility does exist to run into shearing or transmission mechanisms when processing is carried out in a wrong manner, during parts replacement or during machine keeping operations. Elevated levels of noise and of dusts are observed near the multi-blade saw which can result from i) boards hitting the working mechanisms, ii) machine engines, iii) boards jolting on the rollers of the conveyor belts; etc. The labourers of the sample under investigation were therefore observed to be exposed to this **highly likely** risk with a resulting **serious** or **very serious** damage (R9.5: high). The related damage (acute poisoning, asthma, nasal inflammation, hypoacusia, etc.) is not only due to an inappropriate use of the machine, but, and maybe more importantly, to a wrong state of repair of this device. Therefore employers should quantify the time of exposure of labourers to such risks and, if needed, to reduce exposure at most.

e. Chipping

As the chipping system is frequently found at the periphery of the sawmill, access to this area is often uncomfortable and poorly illuminated. Workers can therefore happen to bump into parts of the sawing system or find obstacles in their way, slide on wet ground and sawdust or have problems of any nature due to the lack of room and of light to handle fresh chips. The assessment of the risks connected to this operation in many labourers under study led us to define this risk as **likely** with a **medium** damage (R6: average). As is the case for other dangerous phases, the negative effects on health deriving from a wrong or inappropriate exposure can be summarized as follows: asthma, nasal inflammation, hypoacusia, discomfort, stress. Compensation physical exercise and correct use of PPE can reduce these risks.

f. Stacking and Carriage of finished product

Workers can happen to be hit by the protruding parts of the machines, by bundles or packs of boards stored in the different areas and, when walking in the area of the conveyor belts of the sawing machines, by moving boards. In addition, a poor illumination or an error in driving the handling machines, can result in a risk for the workers to run into fork lifts; the

risk also exists that boards fall from conveyors, from fork lifts or from "intermediate" deposit boxes due to the absence, inappropriateness and/or inadequacy of anti-fall devices. This exposes labourers to the risk of falls, slipping from the top of ladders as well as to ergonomically inappropriate movement repetitiveness. This risk was assessed to be **highly likely** with **mild** damage (R4.5: average). For this reason the containment measures reported in the table 3 can concern, say, the use of ladders prescribed by current regulations as well as the use of safety hooks and/or other devices and prohibition for more than one people to work on the same ladder and the use of specific PPE.

Table 3. Safety guidelines

Operation description	Risks detected	Expected damage	Risk assessment	Safety guidelines	Risk containment measures
<u>Logs handling</u>	Implement/device breakdown or out of control	Various injuries	R3.5: mild (likely with mild damage)	Training of labourers on appropriate working postures and conditions	Potential use of pruning devices
	Inappropriate posture				Compensation physical exercise
<u>Barking</u>	Inappropriate posture	Back-lumbar pain	R5.5: average (highly likely with mild damage)	Assessment of exposures	Appropriate clothing and safety shoes
	Wood Dusts Noise	Asthma, nasal inflammation, hypoacusia			Use of PPE
<u>Logs cutting</u>	Wood Dusts Noise	Asthma, nasal inflammation, stress, hypoacusia	R7: average-high (likely with medium damage)	Training of labourers on modalities to lift heavy loads and appropriate working postures	Use of law compliant equipment
	Being caught in moving parts, contact with parts during operation	Contact injuries Fatigue			Appropriate clothing and safety shoes
<u>Board cutting</u>	Cutting blades	Various injuries	R9.5: high (highly likely with serious or very serious damage)	Assessment of exposures	Use of PPE
	Inappropriate posture	Back-lumbar pain			Appropriate clothing and safety shoes
	Wood Dusts Noise	Asthma, discomfort, stress, hypoacusia			Compensation physical exercise
<u>Chipping</u>	Wood Dusts Noise	Asthma, nasal inflammation, hypoacusia	R6: average (likely with medium damage)	Assessment of exposures	Correct state of repair Use of PPE
<u>Stacking and carriage of finished product</u>	Inappropriate posture Hand lifting of heavy loads	Back-lumbar pain Elevated fall	R4.5: average (highly likely with mild damage)	Training of labourers on modalities to lift heavy loads and appropriate working postures	Potential use of pruning devices Compensation physical exercise

Conclusions

This study has enabled to widen our understanding of the general picture of the sector of primary timber processing, whose many criticalities in terms of work safety have not only been highlighted and observed, but also analysed. The guidelines worked out, are intended to contribute to improve the approach to problems related to the safety of the labourers of the timber processing sector on the basis of the relative risks assessed for each production phase together with resulting potential damage. The sector of primary timber processing in Calabria has been found to be characterized by extremely promiscuous tasks as well as by ill-designed and managed work premises and a lot of gaps in terms of compliance with safety and hygiene standards. On the grounds of the first results obtained, it seems evident that research and personnel training efforts are essential to improve safety conditions within wood processing businesses. This should be done in spite of the fact that the full regularization and compliance with work safety standards of these businesses, will take a lot of time not only for technical reasons but also, and may be more importantly, for the impossibility to adopt cost-efficient measures due to the fierce competitiveness of the sector in question, which is almost exclusively based on price policies.

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