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The wood products industry has historically been considered to be one of the most dangerous for manufacturing employees. Workers are exposed to hazards ranging from falling trees to debarkers to saws to nail guns, while often working under pressures for high productivity. Compounding the danger from these hazards are the mentally and physically challenging working conditions that can include temperature extremes and high noise levels.

Fortunately, managers at many wood-based companies sincerely care about working conditions and the health and safety of their workforce. These producers give more than just "lip service" to safety; they truly believe that safety should be given a higher priority than production or sales volume. Over the past two decades, an increasing number of producers, both large and small, have shown their support of safety by elevating it to a core value as part of the corporate mission statement. Weyerhaeuser, for example, states "safety is a core value… and the company's number one priority" (www.weyerhaeuser.com). An increasing number of astute managers are now realizing that safety is not only important for safety's sake, but that paying attention to safety and investing in safety can pay financial dividends.

The purpose of this article is to draw attention to safety as a critical component of both day-to-day operations and strategic planning within the wood products industry. We discuss instances where the industry has failed in the past and how some producers are succeeding in the battle to achieve profitability while balancing safety, quality, and productivity. Although this article was written to give readers a sense of the danger inherent in our industry, as well as the challenges associated with maintaining a safe operation, we also hope it will provide actionable suggestions for improving safety performance. There is a review of data from governmental sources, but we also draw on results from a recent project that was designed to understand and improve safety performance within the wood products industry. That project included a broad survey of hourly employees, as well as more in-depth interviews with production workers, managers, and safety professionals.

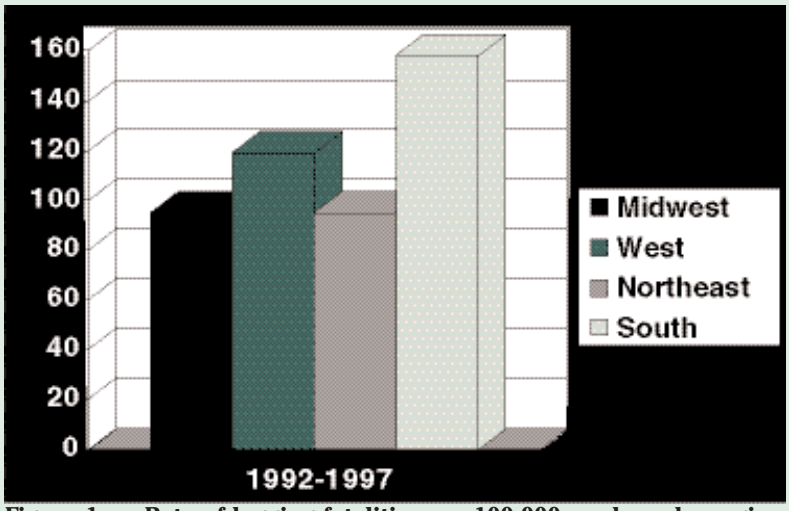

Figure 1. — Rate of logging fatalities per 100,000 workers, by region of the United States, for the period 1992 to 1997 (adapted from Sygnatur 1998).

A Hint of the Danger: Wood-Based Industry Safety Records

If you toured your first logging operation, sawmill, furniture plant, engineered board plant, etc., as a forestry or forest products student, your first impression may well have been that the forest products industry was seemingly a safe place to work. If your professors did their homework before embarking on each field trip, they took you to operations that maintained a safety-oriented culture and were reasonably clean and safe to tour. Do you still maintain that first impression? If so, then you must be fortunate enough to work for one of the remarkable companies that does pay attention to and place priority on the work environment. Perhaps you work in one of the sectors of the wood products industry that is dominated by large companies that have fairly strict corporate safety policies. Or perhaps you work in a research lab and have not had cause to get into a mill or plant since your student days.

Forest Products Industry Fatalities

The processing of timber into lumber, paper, and a spectrum of value-added wood products begins with the processing of standing timber into felled trees and logs that meet the input requirements of the various wood manufacturing industry sectors. The loggers who perform this first processing operation are the most at-risk members of the wood products manufacturing supply chain. In fact, of all the "high-risk" occupations tracked by the Bureau of Labor Statistics (2004), "timber cutters" is the most high-risk. In the United States in 1997, the rate of fatal injuries per 100,000 workers for loggers was 129; the next highest risk occupation was fishing, with a rate of 123 fatalities per 100,000 workers. The national average fatality rate for all occupations in 1997 was 4.7. During the 6 years from 1992 to 1997, 70 percent of the 772 logging fatalities were attributed to the loggers being struck by trees and/or logs. The southern region of the United States, with only 44 percent of the nation's logging employment, recorded 54 percent of the logging fatalities from 1992 to 1997 (Sygnatur 1998) (Fig. 1). There is not a simple explanation for the South's high fatality rate; it is likely attributable to a combination of many factors.

The fatality rate for the entire lumber and wood products sector (standard industrial classification [SIC] 24), which includes the logging sector (9% of the employment in SIC 24 is in logging), is considerably lower than the rate for logging only, but still much higher than for all SIC sectors (approximately 5 times higher) and approximately 6.5 times the rate of all manufacturing workers (USDL 2000a). A positive development is that the number of fatalities in the lumber and wood products sector in 2002 was down by approximately 21 percent compared to the period 1997 to 2001 (20 deaths per 100,000 employees) (USDL 2002).

Forest Products Industry Non-Fatal Injury Rates

Year 2002 data, the most recent data available from the U.S. Department of Labor, tell us that the lumber and wood products sector (SIC 24) had a total work-related injury/illness incidence rate of 10.1 per 100 employees. The rate for the furniture and fixtures sector (SIC 25) was only slightly lower (9.9). The rate for paper and allied products was lower still (5.6). The rates for the lumber and wood products sector and the furniture and fixtures sector are higher than the rate for all private industry (5.3) and for all manufacturing industries (7.2); the rate for paper and allied products is lower than the rate for all manufacturing industries.

The good news is that these rates have shown a downward trend over the last 10 years. This trend is seen in most of the SIC 24 sectors including sawmills and planing mills, wood kitchen cabinets, furniture and fixtures, hardwood dimension and flooring mills, and others. This reduction is considerable and reasonably consistent across sectors, on

the order of 33 percent, between 1990 and 2001 (USDL 2003). Taking a close look at 1999 injury-rate data compared to the 2002 data for the paper and allied products sector gives an indication that the trend toward improvement exists in this sector too: 7.0 recordable injuries per 100,000 workers in 1999 compared to 5.6 in 2002 (USDL 2000b, 2003).

Injury rate data for the wood products manufacturing sector collected in British Columbia, Canada, also show an improvement trend. Over the period 1998 to 2002, there was a 25 percent reduction in the rate of non-fatal injuries in the wood and paper products sector (Worksafe BC 2003). Injuries categorized as caused by overexertion comprised 22 percent of injury claims during the 5-year period. "Struck by" injuries, "caught in or compressed by equipment or objects" injuries, "struck against object" injuries, and "repetitive motion" injuries caused 13, 14, 9, and 9 percent of the injuries, respectively, during this same time frame (Worksafe BC 2003).

These statistics highlight the danger inherent in wood-based industries and by themselves provide considerable justification for attempting to increase safety performance. There are, however, other key reasons why managers in our industries should concern themselves with safety: 1) governmental regulations; and 2) the relationship between "safety management" and corporate competitiveness and profitability.

Regulatory Issues for Workplace Safety

The U.S. government passed legislation in 1970 to aid in reducing the rate of work-related accidents. The law was titled the "Occupational Safety and Health Act" (OSH Act of 1970), and during the past three decades it has had a significant effect on operations in wood-based industries. Over the years, the OSH Act has led to a reduction in occupational accidents, in part by holding organizations legally responsible if employees engage in an unsafe act that results in an injury or a fatality. The Occupational Safety and Health Administration (OSHA), a division of the U.S. Department of Labor, is responsible for ensuring that OSH Act rules, regulations, and standards are being enforced in every organization.

OSHA's Injury Log

The OSH Act requires most employers with 11 or more employees to prepare and maintain records of work-related injuries and illnesses. Some types of employers, such as barbershops, retail outlets, and car dealers, are exempt from recordkeeping requirements even if they have more than 11 employees. OSHA's philosophy is that accurate recordkeeping is a critical part of an employer's safety and health efforts. For example, a key benefit derived from maintaining accurate records is the ability to identify and then correct problem areas that show up in the records, which should lead to the prevention of future accidents. OSHA also believes that company safety and health programs can best be administered with accurate records. From the employee side, workers are more likely to follow safe work practices and report workplace hazards if they have a greater awareness of recent injuries, illnesses, and hazards in the workplace.

When a "recordable" accident occurs, OSHA requires a company to complete an OSHA Form 300 (Log of Work-Related Injuries and Illnesses). Each injury reported is given a specific, nonduplicating case number that will facilitate comparisons with supplementary records. Among other things, the OSHA log must identify when and where the accident occurred while describing the incident as specifically as possible. The seriousness of the incident must also be recorded.

Management teams at wood manufacturers should be very cognizant of what constitutes a recordable incident. Most producers have one or more safety professionals who have received training in OSHA procedures and whose job it is to make sure the company stays in compliance with all regulations, but in some cases the Human Resources (HR) office will maintain safety-related records. An injury or illness is considered work related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a pre-existing condition (www.osha.gov). These include work-related injuries or illnesses that result in death, loss of consciousness, days away from work, restricted work activity or job transfer, and/or medical treatment beyond first aid.

OSHA Incidence Rate

One of the key numbers that producers can use to benchmark their safety performance is called an "incidence rate." OSHA defines an incidence rate as the number of recordable injuries and illnesses occurring among a given number of full-time workers (usually 100) over a period of time (usually 1 year). Incidence rates are valuable because they make it relatively easy to compare trends over time

and to compare performance between multiple companies or industries. These rates may aid in identifying existing problems within the organization and the magnitude of safety-related improvements that need to be made.

All upper managers in the wood industry (e.g., chief executive officers (CEOs), owners, plant managers, etc.) should know their current and historical incidence rates, and know how their rate has trended over time. Key safety personnel within each company should also know how their rate compares to similar producers. Researchers in the safety field, as well as OSHA, recognize analysis and comparison of safety-related data as a valuable method for discovering and rectifying safety-related issues.

Organizational Costs of Poor Safety Performance

Accidents can obviously take a toll on the health of individual employees, but they can also exact a high price on the overall economic health of wood products producers. For example, recent research suggests that wood producers with higher incidence rates have lower profitability than those with few accidents (Rinefort 1998). Accidents are costly to an organization due to a variety of outcomes, including demotivation of workers, disruptions of site activities, delayed project progress, and additional adverse effects on the organization's overall cost structure, productivity, and reputation (Mohamed 1999). In simple terms, poor safety performance can have significant negative impacts on an organization's bottom line. A striking example of the overall costs of poor safety is the estimate that in the year 2000 work-related injuries in the United States cost $131.2 billion. This figure exceeded the combined profits of the top 13 Fortune 500 companies (www.nsc.org)! Some managers in the wood industry realize the financial value of a strong safety record; a good example is International Paper's slogan *Safety: Our Best Return on Investment.*

Reduced operational profitability results from a combination of both direct (hard) and indirect (soft) costs associated with poor safety. Direct costs include medical costs, premiums for compensation benefits, property losses, etc. (Terrero and Yates 1997), and in most cases are easy to measure. For example, 1999 figures from the state of Oregon show that the average costs per worker injury claim were $11,799, $22,111, and $11,923 for sawmills and planing mills, logging, and other wood products operations, respectively (OCBS 2001). Indirect costs, however, are much more difficult to measure, but in many cases may be several times higher than the hard costs. The lost days associated with the Oregon injuries (e.g., 44, 110, and 55 for the 3 industry sectors) are a good example of an outcome that can result in very high indirect costs. Other factors that can increase the soft costs incurred from an injury include time diverted from normal activities for other workers owing to the injury (e.g., lost supervisory time due to covering for injured worker, new employee hiring costs, accident investigation, etc.), and changes in work-related attitudes of employees.

Our research, as well as that of others (e.g., Abler 1979, Brogan 1991, Reppert 1988) has shown that work-related accidents can decrease important job-related attitudes such as employee morale, job satisfaction, and organizational commitment, while increasing intention to quit. It is these changes in work-related attitudes that may in fact result in the greatest combined costs to a producer, and are much harder to estimate with accuracy. In our surveys of more than 1,000 hourly production employees, we found a number of negative outcomes associated with having had an injury. One of the most important for employers was a reduction in employee commitment to the organization. High levels of employee commitment are very beneficial for employers, with low commitment being a common cause of such undesirable behaviors as turnover and absenteeism (Cohen 1993).

Employee turnover is especially relevant to safety performance since wood products manufacturers with low turnover rates generally experience fewer work injuries and vice versa (Rinefort and Van Fleet 1998). As often happens in a mill environment, high employee turnover leads to a large influx of new employees who may be unaware of the hazards in their new place of employment and are more likely to injure themselves or coworkers. Moreover, inexperienced employees are less likely to meet production and quality standards, and hence contribute less to the company's bottom line.

While many managers may comprehend the negative outcomes associated with a serious injury, they may not realize the costs of "safety-related events" (e.g., sawdust in eye, tripping over an object, etc.). Such events are indicative of unsafe conditions and can have detrimental effects even though the incident is not documented. For example, near-misses have been shown to negatively

Safe practices in wood manufacturing include the use of personal protective equipment and a workstation designed to minimize stresses placed on the employee such as height discrepancies and visual challenges due to poor lighting.

impact employee attitudes much the same as an accident that causes an injury (Abler 1979, Brogan 1991, Reppert 1988). Moreover, unsafe behaviors can become routine and often lead to actual incidents (Spears 2002). It is therefore critical that managers also work to identify and minimize environmental conditions and employee unsafe practices that result in "non-recordable" incidents.

An important task is to make sure that every manager in the company understands the true cost of poor safety performance. Hard costs such as indemnity are just the tip of the iceberg in terms of the true drain on profits. Many managers will have a hesitancy to believe that incidents are a significant drain on resources until they see some real numbers. It is therefore a worthwhile exercise for wood producers to have someone with managerial accounting experience attempt to calculate the true costs of their incidents.

Improving Safety Performance

OSHA rules and regulations alone are not the answer to accident prevention. Safety researchers have identified and advocated several approaches in addition to enforcement to help understand this complex problem. Going beyond external regulatory systems, past research to improve occupational safety emphasized the so-called "accident prone" individual and the ergonomic design of equipment (e.g., Sheehy and Chapman 1987). Subsequent research, however, demonstrated that simply trying to eliminate or control unsafe employees did not solve the root cause of the problem. Safety experts such as Geller (1996, 2001) believe that the most productive path to reducing accidents is through a greater use of techniques from industrial psychology and organizational science.

Our research explored these areas in an attempt to help the industry better understand how it might decrease accident rates. Our experiences visiting a variety of wood production facilities, with safety records ranging from near-perfect to poor, has led us to recommend three areas that are critical for achieving low incidence rates (Michael and Lawson 2001). The first key area is to use "systems engineering" approaches to ensure proper ergonomics, plant layout, etc. The second and third keys involve having strong leadership support for safety from upper management and following a system of HR practices.

Ergonomic Issues and Opportunities in Wood Processing Operations

Ergonomics, also known as human factors design, is the science of designing the job and the workplace to foster the safety and efficiency of the worker. Ergonomic-design research and development has been broadly applied by the military and in the transportation industry for many decades. Ergonomics principles, however, have only been applied in many manufacturing sectors during the last decade. Human-factors-based workplace design is now being pursued by many wood products companies in an effort to minimize recordable safety incidents and employee absences, and researchers have recently begun studying ergonomics issues in our industry (e.g., Smith et al. 2000, Monica et al. 2001, Gazo et al. 2002).

Overall, the U.S. wood products industry has not been very attentive to ergonomic opportunities. The proportion of mills that appear to be without even basic ergonomics-oriented enhancements such as adjustable-height stacking carts (scissors lifts) is high. A few individual companies have instituted ergonomics programs, but most of these more attentive companies are in value-added wood products manufacturing. One company, Woodpro Cabinetry (97 employees in Cabool, Missouri) spends about $5,000 annually on its ergonomics program and has reduced its annual worker compensation costs by $42,000 per year in just 3 years. Many of the changes have been based on employee ideas and have been simple to implement – lowering tables and rotating jobs, for example (NIOSH 1997).

Prevention index-based rank	State fund industrial classification	Rate ratio[a]
1	Nursing homes	3.8
2	Roofing	5.1
3	**Wood products manufacturing**	**3.0**
4	Wood frame bldg. construction	2.8
5	Temp help – assembly	5.2
6	Moving companies	5.1
7	Beer distributors	3.7
8	Building construction	2.8
9	Garbage collection	3.8
10	**Sawmills**	**3.2**

[a] Claims incidence rate for the given industry divided by average rate for all industries in the state.

Table 1. — Worst-ranked industries in the state of Washington (out of 300) for non-traumatic, soft tissue, work-related MSDs (Silverstein et al. 2003).

Repetitive motion disorders are now broadly recognized as a real workplace health issue. Unfortunately, the efficiency and productivity benefits associated with ergonomics-based workplace design are often overlooked by companies when faced with the decision of whether or not to invest money to upgrade workstations. The benefits derived from ergonomic improvements made in the mill/plant include not only a lower absentee rate but healthier, more energetic workers, lower worker compensation costs (as much as 60% to 80% over 5 yr.), lower insurance premiums, lower turnover rates, higher productivity rates, improved quality, and better employee morale. Respondents to a Liberty Mutual Insurance survey expressed satisfaction with the return on investment (ROI) they received from their ergonomics programs, with 86 percent indicating these investments produced a positive ROI. Sixty-one percent of the respondents indicated their ROIs were at least $3 for every $1 invested in workplace ergonomics and safety (Liberty Mutual Insurance 2001). In Washington State, the Department of Labor and Industries (2002) states that companies that have implemented mandated ergonomic interventions required under the state's 2000 ergonomics rule have reported an average benefit-cost ratio of 4.24:1.

Ergonomics in the Sawmill Environment. — The relative hazards associated with employment in sawmills compared to other sectors of wood products manufacturing were highlighted in an analysis performed in New Zealand (Laurs 2000). While only 41 percent of New Zealand's wood industry workforce is employed in sawmilling and planing operations, 50 percent of injury cases came from this sector, of which more than half were musculoskeletal disorders (MSDs). The pulp/paper and plywood/ veneer sectors had 10 and 8 percent of the injury cases, respectively, during the period 1994 through 1999 (Laurs 2000). The job tasks that were most commonly cited as sources of MSD injuries included: pulling/ sorting/stacking timber, grading lumber, tailing (offbearing), and saw filing. These jobs required repetitive twisting, pulling, lifting, and reaching (Tappin et al. 2003).

Safety statistics provided by the Oregon Department of Consumer and Business Services (2001) indicate that the most common class of injury suffered by sawmill and planing mill employees in 1999 was sprains, strains, and tears (37% of all work-related injuries/illnesses). Carpel tunnel syndrome cases accounted for approximately 6 percent of Oregon's work-related sawmill injuries in 1999. Oregon's Wood Products Ergonomics website (2003) provides useful information on ergonomics problems and possible solutions in the sawmill and planing mill workplace. Several types of jobs are identified as ones that place workers at higher risk for MSDs. The list of these higher risk jobs is very similar to the list derived from New Zealand labor statistics: lumber handling, circular sawblade filing, and trim saw operation.

Lumber handling in sawmills is and will remain a primary focus of efforts to reduce work-related MSDs. Figure 2 illustrates some comparisons of occupational injury by job type, and shows that feeders/offbearers account for a high rate of claims. Machine offbearers bend and reach for cants, slabs, and boards and these activities frequently require extreme bending, repetitive motions, and high grip forces (Washington State Department of Labor and Industries 2002). Trim saw operators bend and reach repetitively to organize lumber as it approaches the trim saw. Most material handlers in sawmills and planing mills are standing almost all day, which creates additional body fatigue. Cushioning mats, sit-stand chairs, foot rails, and foot gear with cushioning insoles can reduce this fatigue. Between 1991 and 1999 the state of Washington's sawmill industry recorded almost 7,000 work-related MSDs, of which 51 percent affected the neck and upper back (Washington State Department of Labor and Industries 2002). The lower back and upper extremities were injured in 26 and 10 percent of the cases, respectively. Many wood-handling jobs in the sawmill have

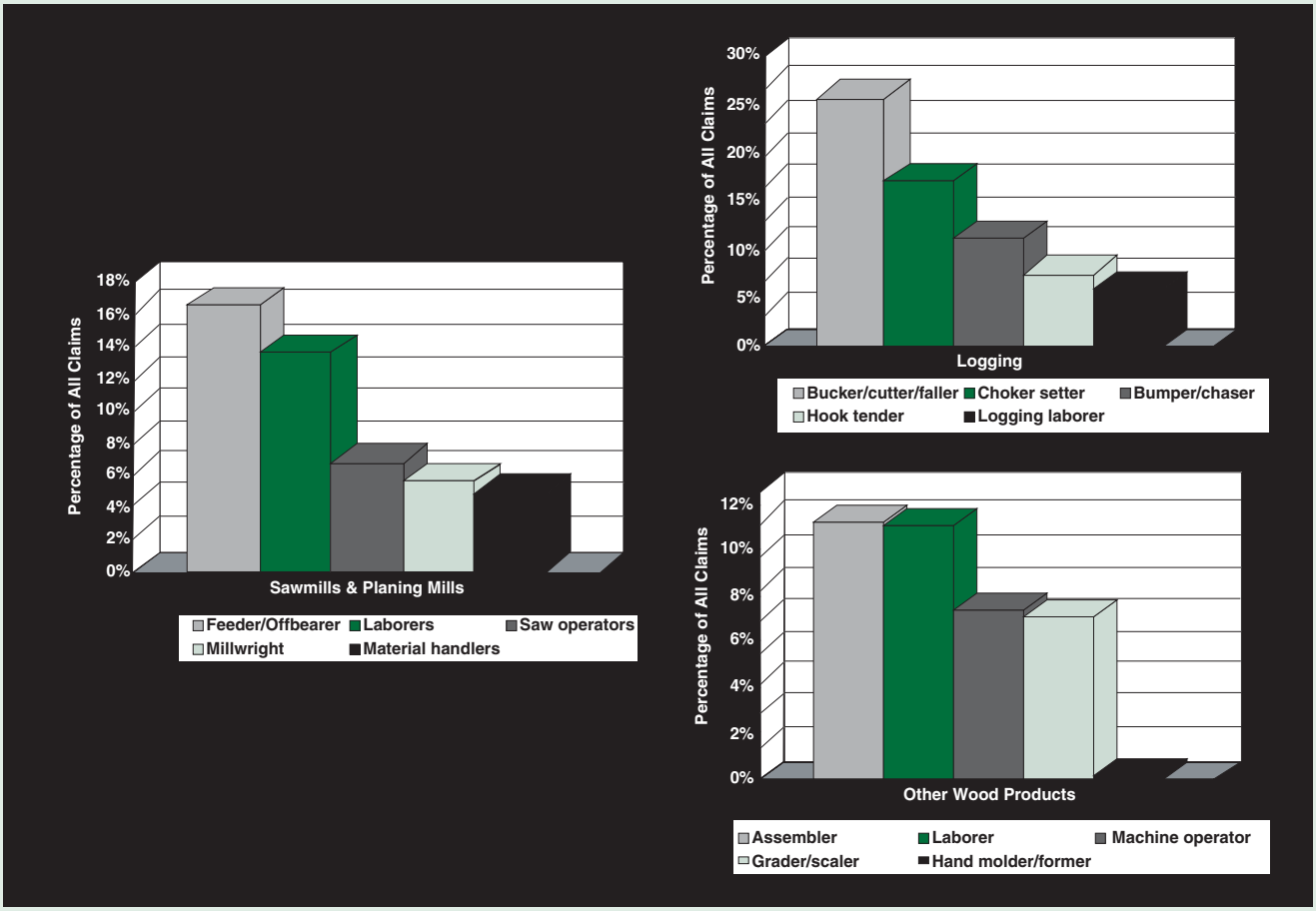

Figure 2. — The percentage of total occupational injuries and illness suffered by the five most affected occupations in three wood products industry sectors.

been designated "caution zone jobs." Hazard analysis, supervisor and employee awareness and training, workstation and job process redesign, and job rotation are appropriate measures for dealing with caution zone jobs. Recognizing the dimensions of this problem, the state of Washington's Department of Labor and Industries has developed an excellent manual that addresses lumber handling problem areas and possible workstation and job design (Tappin et al. 2003).

Ergonomics in Value-Added Wood Products Manufacturing. — The recently published Voluntary Ergonomics Guideline for the Furniture Manufacturing Industry is an excellent source of information and ideas for value-added operations managers interested in upgrading their work environments (AFMA 2003). In the guide's introduction, a Liberty Mutual Group estimate is cited that for every dollar of direct cost (i.e., worker compensation costs) associated with an MSD injury claim, $2 to $5 in indirect costs are incurred.

Researchers at North Carolina State University have identified three furniture industry jobs as high-risk jobs for MSDs: the upholstery process, truck loading and shipping, and orbital sanding (Mirka 1998). In a follow-up ergonomics study conducted at five upholstered furniture manufacturing operations, analyses suggested that the risk of cumulative trauma disorders (CTDs) could be significantly reduced by modifying the materials handling system used to support the frames as they are being upholstered (Piegorsch 1993). Providing workers with the proper equipment and the training to make simple vertical adjustments to the position of the frames so that bending, twisting, and extension postures are minimized can reduce the risk of CTDs of the back by 26 to 54 percent and of the neck by 48 to 87 percent (Piegorsch 1993).

An ergonomics health hazard evaluation conducted by National Institute of Occupational Safety and Health (NIOSH 1996) investigators at the behest of a U.S. wood cabinet manufacturing company provides a good look at issues related to material handling in value-added manufacturing. Over a 2-year time frame, the company had experienced an increase in MSDs in its shipping department. Management wanted to investigate this situation in hopes of arresting the trend. The NIOSH investiga-

tion found that 79 percent of the company's shipping department employees had reported work-related back pain during the prior 12 months. Job analyses indicated that NIOSH-recommended weight limits for lifting tasks were exceeded approximately 50 percent of the time by personnel involved in loading trailers and that some of these overexertions exceeded the recommended weight limits by 300 percent or more. Job redesign, reorganization, rotation, and training strategies were identified to reduce the rate and extent of overexertion in the shipping department.

A comprehensive hazard analysis conducted at three secondary wood products operations identified the primary risk factors for three departments. Risks in the Material Bundling Department were associated with the lifting of awkward and heavy loads (resulting in lower back strain) and manual materials handling leading to hand and wrist strain. In the Flooring Department, the risk factors were the high levels of repetition and manual materials handling activities affecting the forearm, elbow, hands, and wrists. The primary risk factors for the Rough Mill Department were associated with vibration of the boards when feeding the planer and handling of long boards (up to 16 feet in length). Engineering changes, job safety training, and job rotation schedules were introduced to these plants as measures to remediate the material handling hazards (Gazo et al. 2002).

Managing for Safety

A focus on ergonomics alone is not sufficient to achieve an outstanding safety record. Our experience with wood producers suggests that the entire management team must "manage for safety." The two areas that seem to differentiate the safest organizations from the poorer performers are leadership support for safety and a system of HR practices that combine to maintain a safe working environment.

Leadership Support and Commitment. — Our investigations of safety performance in the wood industry imply that mills with the best safety records have a top management team that provides its full support for what can be called a "culture of safety." Specifically, the CEO and the core leadership team at the top of the organization must do more than just pay "lip service" to safety. Leaders must cultivate an organizational culture that truly believes in and values safety.

Besides top management, leadership for safety must also be shown throughout the managerial ranks in an organization. We consider three positions as essential: the mill/plant manager, the production supervisor, and the safety director. Plant managers often act as a "local CEO," and therefore have some control over nearly every aspect of their facility. For example, they can push productivity to meet sales orders and cut corners when budgets are tight, or they can approve all safety-related expenditures without question and set tough penalties for breaking safety policies. Their influence has a direct impact on the culture of safety, which in turn appears to lead directly to a mill's incidence rate.

Production supervisors have the most direct contact with hourly production employees, and their attitudes and behaviors often have the greatest influence on safety-related events. Unfortunately, production pressures and a shortage of hourly employees have forced many mills to use their production supervisors as relief operators. Our evidence suggests that taking production supervisors out of an actual supervisory role can indirectly lead to unsafe conditions, and is generally reflective of poor management practices. Our suggestion is that supervisors need to have the freedom to actually supervise. It must be remembered that these persons were placed in a supervisory position for their brains, not their hands! The best mills allow production supervisors to be involved in hiring decisions, assume training responsibilities for their department, and have legitimate power to discipline unsafe acts. In addition, it is important that supervisors practice safe operating procedures and be held accountable for their department's safety record. Past research in the paper industry also indicates that when managers must take personal responsibility for an injury they will take definitive steps to prevent future occurrences (Stewart 2001).

It is extremely important that producers employ a full-time safety director (sometimes referred to as Safety/Environmental Coordinator), not a part-time person who must split their duties with another task. These persons must be free to oversee the safety aspects of the organization, and as with production supervisors, should have legitimate power to create, implement, and manage practices that promote safe behaviors. We strongly recommend that safety directors work closely with their HR professional to implement the necessary best practices and policies. It is also important that the person in charge of safety have access to a systems engineer who can assist with equipment layout and ergonomic issues.

System of HR Practices. — We have also seen the value of a system of HR practices that work together to assure a workforce that can meet goals for safety, productivity, and quality. These practices are not only valuable for increasing safety performance, but

This is an example of posture and load conditions that may lead to non-traumatic cumulative stress disorders; note the worker's extended reach, the large and awkward load, forward flexion at the hip, and the height discrepency reflected in the tip-toe stance (Gazo et al. 2002).

have also proven to pay dividends across the organization.

A system of HR practices begins with policies and procedures designed to attract and hire high quality new employees into the organization. While many wood industry producers complain of difficulties in finding good employees from today's labor pool (Michael and Leschinsky 2003), the most successful companies have an HR system that allows them to weed out weaker candidates before they ever get on the payroll. And a few really great producers are at the point where they have a waiting list of good people who want to work for them, thus allowing them to choose from a pool of strong candidates for hourly positions. Some of the ways to attract quality employees include good pay rates, responsive leadership styles, and of course, a safe working environment. Naturally, most people will not be attracted to a work environment where they are likely to be injured, either by equipment or careless coworkers.

The best HR systems also include multiple parties in the hiring process. This may start with a review of job applications by an HR assistant, who can give an initial approval and suggest that a candidate be invited in for an interview. That initial interview may include an HR professional as well as someone from plant management. Having successfully passed this hurdle, the interviewee might then meet with their prospective production supervisor and some hourly team members. The HR Director at Pennsylvania House Furniture calls this part of the system "hiring slow," that is, take time when hiring and don't let marginal employees get into your company. One of the primary goals of hiring slow is to reduce turnover of those people who never should have been hired. High turnover has been shown to cost money for wood producers not only in terms of reduced safety (Personick and Biddle 1989) but also in terms of reduced productivity (Veigle and Horst 1982).

New employee orientation programs are also a critical component of an effective HR system. These programs must include in-depth discussions of safety practices (e.g., drug policies, OSHA reporting, etc.) as well as exposure to the various details of their specific positions. An effective initial orientation should last several days and there should be continued regular oversight of new employees during their first 6 months. Safety directors should conduct safety-related orientations designed to cover not only obvious procedures (e.g., lock-out tag-out), but also the less obvious policies such as reporting near-misses and conducting accident investigations.

Once the employees are hired, a producer's HR system should ensure that its people are well trained in proper safety practices. A portion of this training can be conducted at regularly scheduled safety meetings. One valuable practice is to incorporate involvement of the hourly employees in the safety meetings. For example, employees can take turns searching the Internet for safety-related information that they will present to coworkers. Such practices not only create buy-in to the safety process, but can also develop employees' self-esteem and presentation skills. It is also critical that upper management include safety on the agenda of its regular meetings.

Finally, the best HR systems are designed to ensure that hourly employees are heavily involved in the safety process, and that they have clear safety-related guidelines to follow. Some examples of ways to increase employee involvement in safety include 1) programs for making, analyzing, and approving safety-related suggestions; 2) programs that include hourly employees in the hiring and training of their coworkers; and 3) establishing safe-

ty committees composed of volunteer members. Safety guidelines should be given in writing to all new employees as part of their orientation, and should be regularly reviewed and revised as necessary. Managers would be wise to remember that a successful safety program not only requires their own buy-in, but also requires bottom-up involvement from the workforce (Geller 2001). An effective system of HR practices will encourage the safety-related involvement of all employees, and is even more valuable when it dovetails with the drive for improved ergonomics.

Wood Producers Really Can Be Safe

Even though they operate in relatively dangerous environments, wood producers really can have a safe operation. Many wood producers have been recognized by OSHA's Voluntary Protection Program (VPP) for their comprehensive health and safety programs and low incidence rates. In fact, OSHA listed 88 lumber and wood products facilities (SIC 24) that had achieved Star status as of June 30, 2004. The majority of these plants are owned by large, integrated forest products corporations (e.g., Georgia Pacific's sawmill in Green Valley, WV, or International Paper's oriented strandboard plants in Texas). However, smaller operations can also achieve this lofty status. The Curtis Lumber Company in upstate New York is the smallest company recognized by the VPP program; two of its sites have Star status.

Improving safety performance in forest products industries should be a primary concern for managers at all levels. Justification comes not only in terms of human costs (e.g., fingers and toes), but also the financial costs that companies must bear. Poor safety practices are often reflective of poor management practices in general. Following our suggestions for better safety performance can pay dividends on multiple fronts. For example, investing in ergonomic solutions or following strict guidelines for new employee selection and orientation will not only help reduce accidents but can also increase the productivity of the hourly workforce. Given the competitive pressures our producers currently face, it would seem wise to follow ergonomic and management practices that have value not only in human terms, but can also provide a positive return on investment.

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