

INTEGRATED PREVENTION CONCEPT FOR SAFETY AND HEALTH IN FOREST OPERATIONS

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Abstract:

Prevention of safety and health risks in forest operations persists as a major challenge. Huge efforts have been taken over the last decades to reduce accident risks, mainly in motor-manual work, and prevent work related diseases both for manual workers and machine operators. Still, the safety and health situation in forest operations is problematic. This is particularly the case in small and micro service enterprises which today form the majority of the forest operation workforce.

Although knowledge about beneficial work organisation, safety education and training, and safety and health management in forest enterprises is widely available, preventive measures are rarely implemented in forestry. Further, numerous examples of effective preventive measures which are applied in other industrial sectors, are rarely used in forestry.

A research team of forest operation experts, work scientists, psychologists, and contractors has formed for a three year project, funded by the German Ministry of Science, to develop an integrated prevention concept that meets the specific needs and management structures of small enterprises, that fosters health competences of individuals, that finds acceptance in enterprises, and is economically affordable. This concept, consisting of approved and newly developed prevention measures, will be adapted to the specific conditions in small forest enterprises, and will be tested and evaluated with forestry contractors and their workforce.

This paper presents the first project phase: An in depth analysis is carried out to assess and map which prevention measures are actually applied in German forestry. Assessment of effectiveness will identify drivers and barriers for success and distinguish good practices. This will ensure that already successfully applied measures will be further used, improved, and integrated into a wider concept. Further, it shall foster the integration of actors in actual prevention work, namely accident insurers, into the subsequent project work and the durable implementation of the project results. Assessments in forestry are complimented by the investigation of good practices of prevention measures in other sectors with regard to their applicability into a holistic prevention concept for forest operations. This will result in packages of prevention measures which will be assembled for testing and evaluating in forest enterprises.

Keywords: Safety and Health, Prevention, SMEs, Integrated research and development

1 Ongoing challenge to prevent accidents and work related illnesses

Accident prevention and the reduction of health hazards always have been in the forefront of forest operations research and forest engineering. It is widely acknowledged that forestry work is one of the most dangerous professions with regard to accident risks, and it is also commonly known that forest machine operators are faced with serious stress and strain related health hazards. The risks to safety and health of forest workers have been analyzed and documented since decades. Subsequently, conclusions and recommendations for improving the situation were drawn up by many researchers. Already in 1964 Bernt Strehlke called for mutual initiatives of forest owners, workers, and accident insurers and for

uniform accident prevention regulations. Strehlke further requested a continuous analysis of health risks related to the introduction of new technologies and processes.

Accident and health risk analyses, prevention initiatives and technical development led to the assumption: "Safety and Health in Forestry are Feasible!" This was acclaimed in the title of a seminar held in the year 1996 (FAO/ECE/ILO, 1997). At this seminar an international community of experts presented a wide range of solutions for various safety and health problems. Presentations and discussions highlighted the enormous accident risks of motor-manual work and the risks for machine operators to suffer from musculoskeletal disorders. The proposed solutions were among others

- to enhance training and education to develop the skills to work safely;
- to develop integrated safety programmes on enterprise and forestry sector level as a whole;
- to enforce safe behavior at workplaces, whereas it was understood that the behavioral aspects were not yet sufficiently understood;
- to pay high attention to the health implications of mechanized harvesting.

Since 1996 forestry has changed in many ways but the outlined problem are still relevant today.

The **organization** of forestry work has undergone a radical change with a continuing shift from a workforce that traditionally was directly employed by forest owners to private companies. Today, the majority of forestry work is carried out by service enterprises. In Germany close to the total of mechanized harvesting is in the hands of service enterprises which are mainly small or even micro companies with an average of three to four people working in forest operations.

A significant change is also related to **technical** development. Primarily, the ergonomic design of forest machine has improved significantly over the last twenty years. E.g. European ergonomic and safety guidelines for forest machines were developed as a key result of the EU funded project "Ergowood" (Gellerstedt, 2006). Forest machine manufacturers draw a high attention on safety and comfort in their workplace design (e.g. Komatsu, 2016). And last but not least ergonomics and safety are core aspects of testing and certifying forest machines by the Kuratorium für Waldarbeit und Forsttechnik in Germany.

Despite the enormous technical improvement and an overall risen awareness for the importance of safety and health in forestry work (see e.g. the UNECE/FAO Action Plan for the Forest Sector, Forestry and Timber Section, 2014), the situation has not improved significantly. Statistics show that accident rates are still on an unacceptable high level (e.g. in Austria Tsioras et al., 2014, and in Germany Morat, 2016). This accounts particularly for some state forest enterprises in Germany where, after a phase of reduction during the past ten years, the accident frequency increases again (Morat, 2016). However, a detailed analysis of the reasons is still subject to further research, but pure figures show that accident prevention in forestry has not yet achieved a desired effect and that it needs continuous efforts. While accidents have become better recorded for large enterprises, respectively state forest enterprises, there still is a considerable lack of empirical data for the safety situation in small and micro service enterprises.

Compared to accident risks health implications of operating forest machines are much more difficult to assess, since work related illnesses are effects of long term risk exposure that are still not documented sufficiently to draw conclusions. The assessment of risks therefore still relies on earlier scientific knowledge (for scientific review see Lewark, 2005) and on theoretical considerations taking into account on the positive side the ergonomic improvement and on the other hand risk factors related to increasing production pressure. This leads to a considered hypothesis that the health risks which were described in the past are not yet eliminated by advanced technology.

2 Complex problems call for integrated prevention concepts

Safety and health hazards are complex problems. They are firstly related to the personal behavior of the workers, their skills and motivation (or the lack thereof) to work safe. Secondly, they result from risks which lie in the nature of the work itself. This is particularly the case for motor-manual harvesting and skidder operations. And last but not least problems are connected to the planning and organization of tasks and operations and the management of safety and health in enterprises. In addition to these obvious

factors there are many other aspects which have an impact on safety and health. Just to name one, individual predisposition to cope with strain, also related to age of workers, becomes more and more a matter of concern since the workforce in average is ageing.

Based on the awareness that safety and health in forestry work has not reached a satisfactory state confirming that “Safety and Health in Forestry is Feasible”, effective prevention needs to address the complexity of work processes and work organization. There are various health risks which separately do not reach critical levels, e.g. whole body vibration on modern forest machines which has not been rated as a health hazard (Rottensteiner, 2014), but in combination with long exposure time and mental strain, work related diseases may arise.

Psychological, technical and organizational measures need to be integrated in prevention concepts rather than focusing on individual safety and health measures. To this end, a joint research project with an transdisciplinary approach was launched in June 2016. Funded by the German Ministry of Science a research team of forest work scientists, psychologists, technical and organizational ergonomists, and practitioners is ready to take the challenge to develop integrated prevention concepts for safety and health in forest operations.

3 State of the art of prevention

A general assessment of the existing and applied prevention measures shows that an enormous wealth of knowledge about work environment and working conditions exists. A review of the existing and practically applied measures has recently started, following the goal to build a catalogue of “good practices.” Already a first overview of recently reviewed material shows, that for many problems solutions already have been proposed:

- The ILO “Code of Practice – Safety and Health in Forestry Work” (1998) provides an integrated framework for managing safety and health.
- Safety and health management systems are promoted in the “Guide to Good Practice in Contract Labour in Forestry” (FAO, 2011).
- A wide range of safety and health regulations exists.
- Health and safety management systems have been introduced in companies, mainly in some state forest enterprises. A successful example is reported from the forest enterprise of the federal state Hessen in Germany, where a continuous coaching and consulting project, which is directly addressed to forest workers at their workplace, has led to a substantial improvement of safety (Gerding, 2015).
- Recommendations for preventive work organization were the results of the two EU funded projects “Ergowood” (Gellerstedt et al., 2005) and “COMFOR” (Kastenholz et al., 2009).
- In addition to a keen knowledge of “good practices”, ergonomic research continues to provide more insight into stress and strain in forestry workplaces (e.g. Häggström, 2015).

Despite the availability of a wide range of available prevention measures, safety instructions and regulations, it is a guiding question for the actual research activities:

Why are safety and health problems in forestry still alarming?

The reasons why the implementation of effective prevention measures works in one enterprise and fails in others need to be investigated closer. Knowledge about drivers and barriers for effective prevention will provide one of the keys to effective safety and health protection. Of course, there are general rules and regulations which are undisputable. (This accounts particularly for motor-manual harvesting, where neglecting of safety regulations still is a major accident cause.)

One driver definitely is management commitment to increase safety on the level of a whole enterprise. Enhancing skills and raising motivation of workers, and the enforcement of regulations have shown positive results in Hessen-Forst (Gerding, 2015) where an integrated company policy underlined with continuous interventions at the workplaces was implemented.

While drivers in many cases may be obvious, it will be much more difficult to detect barriers for effective prevention concepts. They can be related to the personality or competences the enterprise owners. Measures may not fit an individual enterprise and its task areas. Barriers may lie in the structure of an enterprises, e.g. when irregular or seasonal workers are employed which have insufficient skills. The forthcoming research activities will particular focus on identifying such barriers, and will assess how to overcome them.

One remarkable example for a barrier to long term effectiveness of prevention was the concept to reduce work related strain on forest machines by advanced work organization concepts. Since it was analyzed in Sweden that many machine operators suffer from musculoskeletal disorders (Pontén, 1988, see also Lewark, 2005), the Swedish labour authorities endorsed a regulation to reduce the risk exposure time of machine operators. As a result, work organization concepts were designed with job rotation between machines and job enrichment by adding organizational tasks to the workers' tasks (Lidén and Erikson, 1991). This concept was widely promoted and it can be considered as state of the art for improving forest machine operators' health (Gellerstedt et al., 2005, Kastenholz et al., 2009). However, after an enthusiastic uptake in Swedish forestry in the early 1990s, this concept was turned down. The general reason provided in subsequent reviews was: It was not economical (Hägström, 2015; Ager, 2014). Hultåker (2006) explained, that this promising and from the scientific point of view "best" work organization concept did not fit the organizational structure of small enterprises in Sweden and thus lacked acceptance in a long run.

This example shows that prevention measures first of all need to be accepted by the entrepreneurs and the workers to gain sustainable effects. To this end the recently launched project will develop and test integrated prevention concepts together with enterprises. It is expected that this will be the best way to reach acceptance and to overcome barriers. E.g. a low expectation of benefits from cost for prevention is expected to become a major obstacle. This barrier will be lowered, when entrepreneurs are integrated in the evaluation of prevention measures and when they are encouraged to draw up their own recommendations for designing integrated concepts that will fit the structure of their respective business.

4 Challenge to reach small and micro enterprises

The challenge for improving safety and health is particularly big for small and micro enterprises which offer services in forest operations. They very often have limited professional management capacities and frequently employ workers who are not formally trained and educated. Further, these micro enterprises are generally under continuous economic pressure due to low profit margins of their business. They are hard to reach and control by labour inspectorates and accident insurers and they have little access to consulting and support for prevention measures (Kastenholz and Lewark, 2005).

Therefore, particular attention of the upcoming research and development activities will be given to small and micro enterprises in forest operations. They are actually the most critical and most vulnerable target group with regard to safety and health. Statistical evidence for the particular high safety and health problems in small and micro enterprises is not yet sufficiently available, since there is still no mutual statistic for all forest operations in Germany (see Strehlke's recommendations from 1964!). This applies to accidents but even more for work related illnesses like musculoskeletal disorders caused by physical strain both from manual and machine work. Apart from the very detailed epidemiological studies carried out in Sweden in the late 1980s (Ponten, 1988), there is rather limited knowledge about machine operators' health. However, it is well known that, despite the enormous ergonomic improvement of forest machine workplaces, operators in small enterprises are still exposed to the most critical risk which is long working hours with repetitive tasks and high mental strain (Lewark, 2005).

The forest operations service sector is very heterogeneous and fragmented with regard to task areas, size of enterprises, skills and competences of workers and entrepreneurs, and technical equipment. Therefore, it can be foreseen that prevention concepts must integrate a variety of measures and need to be flexible and adjustable to individual enterprises. A major challenge is to develop the best approach to meet contractors' mentalities and expectations to motivate them to implement prevention measures. Therefore, it needs the integrated approach from psychological, technical and of course forestry point of views to

develop concepts which integrate existing measures, which have proven to be effective in forestry, and prevention measures that will be adopted from other industrial sectors.

5 From research to a prevention alliance for forestry

The overall objectives of the recently started integrated research approach are to

- improve safety and health in forestry work;
- raise the attractiveness of forestry work as a professional career;
- ensure the future availability of a competent and motivated forestry workforce.

Towards these goals the project partners have started with the broad assessment of the state of the arts in safety and health in forestry. Already at an early stage of the project work it becomes clear that we have a well equipped tool box with prevention measures which have proven their effectiveness in many companies and operations in forestry and in other industrial sectors. The major challenge is to transfer the existing knowledge and the available tools to the people who are concerned, who are the entrepreneurs and the workers.

It is of utmost importance that prevention measures will find acceptance particularly in small and micro enterprises. The argument “it sounds good, but that does not work here in my enterprise” is familiar to all researchers who strive for implementing scientific knowledge in practice. It needs to be better understood, why a prevention measure which has been scientifically generated and which has proven that it works in one place should not be effective in another enterprise. To this end contractors and workers are integrated in the research and development process from the very beginning. Testing and evaluating measures and concepts together with enterprises will uncover mental, psychological, social, organizational and technical barriers, and it further will lead to “prevention competences” in enterprises. This research approach will also integrate other important actors of prevention in forestry, namely the accident insurers, which in Germany also have the authority as labour inspectorates. They are particularly concerned how to motivate enterprises to improve safety and health, because their prevention approach more and more needs to rely on individual responsibility in enterprises, since their capacities to enforce and control safety regulations are rather limited.

The expected outcome of a three year research and development project are packages of prevention measures which will fit to the conditions of individual enterprises, which meet the needs and solve the actual safety and health problems, and which are acknowledged by entrepreneurs and workers for being beneficial and cost effective. Accident insurers will assess during the whole project process that the project approach will be complementary into their prevention tasks and that the results will become sustainably applicable. Thus, the project work will result in an alliance of various actors from science, consulting, authorities, and practice to improve safety and health in forestry.

6 References

Ager, B. (2014) Skogsarbetets humanisering och rationalisering från 1900 och framåt. *Luleå tekniska universitet*.

FAO (2011): Guide to Good Practice in Contract Labour in Forestry. Rome.

FAO/ECE/ILO. 1997. Safety and health in forestry are feasible. *Proceedings of a seminar held in Konolfingen, Switzerland 7 to 11 October 1996*. Berne, Swiss Forest Agency.

Forestry and Timber Section, 2014. Rovaniemi Action Plan for the Forest Sector in a Green Economy. Geneva Timber and Forest Study Paper 35. United Nations, Geneva.

Gellerstedt S. (Ed.) (2006): European ergonomic and safety guidelines for forest machines 2006. Sveriges lantbruksuniversitet. Uppsala.

Gellerstedt, S., Bohlin, F. and Liden, E. (2005): Health and Performance in Mechanised Forest Operations”. A handbook produced by ErgoWood, a project co-financed by the EUROPEAN COMMISSION Quality of Life and Management of Living Resources – QLK5-CT-2002-01190. Sveriges lantbruksuniversitet. Uppsala.

Gerding, V. (2015) 10 Jahre Arbeitsschutzberatung beim Landesbetrieb Hessen-Forst. *Forsttechnische Informationen*, 3/2015, 18-25.

Häggröm, C. (2015): Human Factors in Mechanized Cut-to-Length Forest Operations. *Doctoral Thesis. Swedish University of Agricultural Sciences*, Umeå.

Hultåker, O. (2006): Collective initiatives on improving work environment in Swedish mechanised forestry – A case of institutional entrepreneurship and change. In: Lars Lönnstedt and Björn Rosenquist (eds.): *Proceedings of the Biennial Meeting of the Scandinavian Society of Forest Economics, Uppsala, Sweden, 8th-11th May, 2006*. Uppsala.

ILO (1998): Code of Practice – Safety and Health in Forestry Work. Geneva.

Kastenholz, E., Lewark, S. (2005): Gesundheitsschutz in kleinstbetrieblichen Arbeitsformen – eine Herausforderung für eine zukunftsfähige forstliche Arbeitswissenschaft. In: GfA (ed.): Personalmanagement und Arbeitsgestaltung. *Bericht vom 51. Kongress der Gesellschaft für Arbeitswissenschaft*, 713-716.

Kastenholz, E., Hudson, B. and Lidén, E. (2009): Tools and Methods for Improved Health and Performance in Forest Enterprises - an executive summary of a 3 year development project. *COMFOR Working Paper*. Ed.: ENFE - European Network of Forest Entrepreneurs, Sölden.

Komatsu (2016): Ergonomics. Available at: <http://www.komatsuforest.fi/ergonomics> (accessed 8. Aug. 2016).

Lewark, S. (ed.) (2005): Scientific reviews of ergonomic situation in mechanized forest operations. *Inst. för skogens produkter och marknader*, Sveriges lantbruksuniversitet.

Lidén, E. and Erikson, E. (1991): Aktionsprogram mot belastningsskador i skogsarbete - genomförande och utvärdering av nya arbetsformer inom ett skogsbruksområde. (Measures against repetitive stress injuries in forestry work - implementation and evaluation of new work organization within a forest area). *Uppsatser och Resultat - Sveriges Lantbruksuniversitet, Institutionen för Skogsteknik, no. 214*. Garpenberg.

Lindroos, O. and Burström, L. (2010): Accident rates and types among self -employed private forest owners. *Accident Analysis & Prevention*. Volume: 42 Number:6, pp1729-1735.

Morat, J. (2016): Unfallstatistik für den Staatswald in Deutschland. Available at: <http://www.kwf-online.de/index.php/wissenstransfer/waldarbeit/71-unfallstatistik-fuer-den-staatswald> (accessed July 18, 2016).

Pontén, B. (1988): Health risks in forest work: a program for action. *Rapport, Sveriges lantbruksuniversitet, Institutionen för skogsteknik*. Garpenberg.

Rottensteiner, C. (2014): Vibration analysis of forest operations and road construction. *Dissertation*. University of Natural Resources and Life Sciences, Vienna.

Strehlke, B. (1964): Unfallverhütung in der Forstwirtschaft. *Mitteilungen des Kuratoriums für Waldarbeit und Forsttechnik, Band II*. Frankfurt, Buchschlag Vlg.

Tsioras, P.A., Rottensteiner, C., Stampfer, K. (2014): Wood harvesting accidents in the Austrian State Forest Enterprise 2000–2009. *Safety Science* 62, 400–408.