BENEFITS OF A
PARTICIPATORY SAFETY AND HAZARD MANAGEMENT PROGRAM
IN A BRITISH COLUMBIA FORESTRY AND LOGGING ORGANIZATION

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The rationale for involving employees directly in industrial safety
and hazard management programs is based upon the fundamental
behavioral cybernetic principle that those most directly affected by
workplace hazards, the employees themselves, should be given direct
opportunity to participate in making decisions regarding how those
hazards are managed in relation to work operations. This case study
report describes methods and results of a participatory safety and
hazard management program, based intensively on employee involvement,
which has been implemented in a British Columbia forestry and logging
organization. The program was introduced into the six separate
company logging camps, covering 50-60 employees per camp, and was
structured in terms of six participatory elements: employee
involvement, management involvement, follow-up action, trust and
communication, planning, and leadership. Employees now directly
influence or share responsibility in 16 of 18 distinct decision-making
areas affecting logging operation safety. From 1982 to 1985, the
company forestry and logging group experienced a 75 % decrease in
accident frequency, and a 62 % drop in compensation claim costs, which
managers and employees alike attribute directly to the program. We
conclude that the human factors approach to organizational design and
management, centered on the behavioral cybernetic principle of
employee participation, constitutes a compelling model for future
development of safety and hazard management programs.

PURPOSE

The concept of industrial safety and accident prevention as an essential management
function is a relatively recent idea that has yet to gain complete acceptance across
all industrial sectors (Pope, 1981). It can be anticipated that with the current
trend in North America towards greater involvement by employees themselves in
self-management and self-control of workplace hazards (Bryce, 1981), the present
uncertainty regarding the definition, criteria, and terms of reference of the safety
management concept will continue and may indeed intensify. One major shortcoming in
this area has been the lack of a comprehensive conceptual framework, along with
explicit methodology, to guide the organization of hazard management programs based
on employee participation. A further lack is the availability of tangible evidence
from operating organizations regarding the effectiveness and consequent validity of
the participatory approach. These issues were addressed by Smith, Lockhart, and
Smith (1983), who delineated the theoretical framework of the cybernetic systems
approach to managing job hazards, an approach which relies on a participatory
strategy built around employee involvement. This report then went on to detail three

different participatory hazard management methodologies which have been developed in different organizations.

The theoretical and methodological review by Smith, Lockhart, and Smith (1983) underscored the lack of concrete evidence, from actual organizations, which could be used to document the effectiveness and validity, or lack thereof, of the participatory approach to safety and hazard management. The purpose of this case study report is to describe methods and results of a participatory safety and hazard management program, based intensively on employee involvement, which has been implemented in the Forestry and Logging Group of Whonnock Industries (Vancouver, B.C.), a major British Columbia forestry company. The program appears to have had dramatic and highly beneficial effects in reducing the frequency and costs of work-related logging accidents over a four-year period, from 1982 to 1985.

THEORY

The theoretical basis of the cybernetic systems approach to safety and hazard management has been developed in a comprehensive series of articles by Smith (1973, 1974, 1975, 1979, 1980) and by Smith and Sauter (1981). The theory has been condensed in the following ten behavioral cybernetic systems principles of hazard management, set forth by Smith and Smith (1983): (1) a safe job is a healthy job; (2) control hazards, not accidents; (3) hazard management is a behavioral cybernetic process; (4) a safe job is a human factored job; (5) base safety standards on operational performance factors; (6) promote self-regulation; (7) involve the employee; (8) integrate safety with production; (9) implement no-fault compliance provisions; and (10) establish equal opportunity for safe work.

As used here, the term safety system refers to the network of individual employees and managers, along with the businesses and industries, unions, governmental agencies, regulatory bodies, insurance groups, and safety specialists and professionals, that collectively define and determine safety and accident prevention policies, programs, and practices. The cybernetic or systems theory of safety and hazard management emphasizes the primary self-regulatory role that those most directly affected by workplace hazards, namely the employees and managers themselves, must play in the hazard management process. The above principles, and most particularly principles two through eight, establish a conceptual framework for the cybernetic approach which we believe can be used to achieve optimal control of workplace hazards.

A starting point for the cybernetic theory is the concept that hazards are defined and subject to control only if they are detected and their potentially adverse effects anticipated. Thus, hazard control is a predictive, feedforward process (Principle 2) which depends on the behavioral and social interactive skills and competency of the entire safety system (Principle 3) in recognizing, evaluating, and controlling hazards (Smith, 1973, 1974, 1975; Smith and Smith, 1981; Tuttle et al., 1973). There is growing scientific evidence to suggest that unsafe or defective working conditions, in addition to unsafe acts, represent primary causal factors in many industrial accidents (Hansen, 1982; Smith, Ginnold, and Brandl, 1982; Sass and Butler, 1978; Hagglund, 1976; Mason, 1973; Swain, 1973a, 1973b). This evidence supports the concept that industrial safety, therefore, is directly and inextricably linked to how job, workstation, and equipment designs are human factored to conform to the behavioral, physiologic, and performance limitations of the employee (Principle 4). Thus, adoption and enforcement of physical safety standards and negligence regulations will not insure safe work unless the job itself is factored to

meet human needs (Smith, 1973, 1974, 1975, 1979).

The foregoing concepts pave the way for the two tenets which represent the lynchpin of safety cybernetics: self-regulation and employee involvement (Principles 6 and 7). The essence of the theory is that individual workers and organizations most directly affected by workplace hazards should be primarily responsible for managing and controlling them (Smith, 1973, 1974, 1975, 1980; Cohen, Smith, and Anger, 1979). A major industrial resource for achieving such self-regulation is the employees themselves, whose insight and understanding of their own work operations, conditions, and performance demands can be employed for effective detection and predictive control of the effects and scope of job hazards (Bryce, 1981; Smith, 1974, 1975, 1980; Viaene, 1980).

A variety of objective scientific evidnce now is available to support the theoretic concepts outlined above. For example, a number of studies show that workers are very capable of identifying hazards associated with their work, hazards which often are unrecognized by management or by existing regulations (Coleman and Smith, 1976; Kaplan and Coleman, 1976; Gottlieb, 1976). However, little evidence has yet been reported to clearly document the effectiveness of operational safety and hazard management programs based on employee participation.

WHONNOCK PARTICIPATORY FORESTRY AND LOGGING SAFETY AND HAZARD MANAGEMENT PROGRAM

In 1982, both the accident frequency rate and the workers' compensation (W.C.B.) costs for the Whonnock Industries Forestry and Logging Group exceeded the B.C. industry-wide average, with the former index almost three-fold higher (Figure 1). This pattern, which also had prevailed in other previous years, prompted the company to make a commitment to a revised forestry and logging safety and hazard management program based on two basic principles---accident prevention and employee participation. The program was introduced in 1983 with the cooperation of the union representing company workers---International Woodworkers of America (I.W.A.), Western Region. The following subsections detail results of the program, based on trends in company logging accident statistics from 1982 through 1985, as well as organizational elements of the program identified as having contributed significantly to the results observed.

P r o g r a m   R e s u l t s

As illustrated in Figure 1, for the years 1982-85, Whonnock Industries experienced a 75 percent decrease in accident frequency, and a 62 percent decrease in total W.C.B. claim costs, for the Forestry and Logging Group. Over sixteen different forestry and logging occupations are covered by these statistics, including faller, hooktender, choker, rigging slinger, landing, chaser, bucker, loader, grapple/spar, truck driver, shop, road, dry sort, boom, and labourer employees, as well as foremen.

The positive trends were particularly evident for the last two years (1984-85), which saw a 62 percent decrease in accident frequency, a 52 percent drop in claim costs, and a reduction in annual serious accidents (30 or more days lost-time) from 17 to 4. With these improvements in logging safety, company records also indicate increases in productivity by at least ten percent, and in total man hours of employment, from 1982 to 1985.

The direct cost saving realized by the company from safer logging has been calculated

to be $150,000 per year, which reduces by more than ten percent the company's annual compensation assessment. Company and employee representatives estmate that there have been equally substantial indirect cost savings through such factors as fewer interruptions to production, less equipment damage, better morale, and improved labour-management relations.

Safety trends for the entire Whonnock Forestry and Logging Group (Figure 1) are reflected in individual trends for the six company operations in the Group, each of which employs 50-60 people (data available upon request). The individual operations displayed substantial differences in their rate of progress from 1982 to 1985, and in the severity of the initial conditions which required improvement. This is indicative of other differences among the operations, related to manpower characteristics and logging technologies employed (ranging from helicopter to more conventional high-lead logging). The distinctiveness and relative autonomy of each of the six operations created both a challenge and an opportunity for the development of a participative approach to safety.

Program Development

The process of developing a participative safety program has itself required a participative approach. From the the outset, the Whonnock program had to achieve a balance between the need for flexibility to respond to the individuality of the separate logging opeations, and the need for consistency within the company as a whole and within the terms of one collective agreement with the I.W.A.

Program development began slowly. The first year, 1981, was devoted to periodic discussions and seminars between two levels of company management, the head office managers and the superintendents of the various operations, who together examined the concept of expanded employee participation in company decision-making. These discussions represented a head management initiative, prompted be a general interest in the concept of employee involvement, coupled with specific concerns about the company's safety record. This also was a period of considerable resistance to this organizational cybernetic concept. Nevertheless, leadership in the company supported a second year of limited exploration in 1982, focusing on safety as one area where improvement was necessary and where introduction of employee participation might be particularly useful. A relatively cursory audit of the current safety programs and of the safety performance of the various operations was conducted, and the year culminated with an agreement between Whonnock management and the I.W.A. to initiate an effort to improve safety through an approach emphasizing two principles: (1) prevention of accidents and injuries; and (2) participation of hourly employees.

Within the framework of these two general principles, the third year of the project was devoted to an intensive training and communications effort, to involve elected hourly employee representatives and logging supervisors in determining what specifically would be required in logging operations to improve safety, and to promote the participation of employees in on-the-job safety and hazard management practices and procedures. Employee representatives and supervisors from each logging operation were delegated to establish revitalized joint camp safety committees, that would provide effective organizational structures through which participants could exercise shared responsibility for logging safety. Camp employees, union officers, and camp supervisors also participated with senior management of the company in developing a revised statement of the company's overall safety policy.

A vital part of the program in the next two years, 1984-85, was the continuation of the safety training and communication workshops, bringing together employee

representatives and supervisors from the various logging operations. This process generated continuous learning about safety among peers, and supported the emergence of leaders in safety among employee and supervisory ranks. The meetings also reinforced communication up and down the organizational hierarchy, between senior management, union representatives, supervisors, and hourly employees.

Both the employee representatives and the supervisors from the separate logging operations therefore have participated in three levels of program development. They have regularly reviewed with senior management and union representatives the general policy framework. They have concentrated on developing detailed program structures for their own individual operations. Finally, they have supported individual employees and work groups in the development of crew-specific hazard management procedures.

Coordination of the learning process associated with this approach has been the task of an external facilitator, the senior author of this report. Notwithstanding the critical role played by the facilitator in such a program (as set forth by Smith, Lockhart, and Smith, 1983), the key decisions about the direction of the program have always been made by line management and employee representatives. Indeed, employees are now playing an increasing role in the evaluation and redesign of the overall company program.

Program Organization

The organization of the Whonnock safety and hazard management effort has been structured in accordance with three major management objectives, listed below along with the principle subobjectives.

1. **Hazard Management by Individuals and Work Groups at the Worksite**
   a. Immediate detection and communication of safety problems among crew and foremen.
   b. Constant inspection of worksite and work practices by crew and foremen.
   c. Reporting of, and learning from, near-accidents and close calls.

   d. Effective job safety analysis for purposes of training and education.
   e. Development of engineering guidelines for safer logging.

2. **Camp/Operation Safety Program Management**
   a. Shared decision-making responsibility by employee and company representatives.
   b. Camp program/performance monitoring and evaluation.
   c. Development of effective safety procedures.
   d. Safety coordination among crews.
   e. Resolution of more difficult safety problems and issues.

3. **Company Safety Program Management**
   a. Safety policy, commitment, and leadership by management, with union support, and guidance by the Workers' Compensation Board of B.C.
   b. Training, education, information, and other support for individuals and operations to improve safety.
   c. Monitoring of camp safety programs and performance.
   d. Development and evaluation of company safety effort by management and employee representatives.

Woven through this structure are the key elements of 'participation': employee involvement, management involvement, follow-up action, trust and communication, better planning, and leadership development. These factors, explained below, were identified by Whonnock employees, supervisors, managers, and I.W.A. officers, in a survey conducted in 1985, as having contributed most significantly to the improvement in safety in the company forestry and logging operations.

Employee Involvement. Employees on-the-job have been encouraged to identify potential safety problems, and wherever possible, to recommend solutions. Among Whonnock loggers, one of the most effective and concrete ways developed to promote identification of hazards has been a reporting and analysis system for near-accidents. Different operations and different crews have evolved a variety of reporting procedures, with a consistent emphasis that reporting be done anonymously. Over time, the frequency and effectiveness of near-accident reporting has improved significantly. Another useful strategy has been the regular review, and possible re-writing, by loggers themselves of job safety procedures, especially where employees take a major role in job training and inductions.

These employee initiatives depend upon, and are fostered by, good communication between crews and their respective foremen. Moreover, the credibility of the whole process rests upon a balanced and equal participatory role by employees and management in joint safety committees having substantial authority. Despite their lack of official, legal authority, these joint committees exercise de facto authority, because of membership on the committee of the senior management person on-site (usually the camp superintendent).

There have been difficulties in developing this participatory approach. Some management personnel have resisted sharing de facto authority. Some employees have wanted the authority, but not the responsibility that goes with it. However, the sense of direction given to this program by the company and the union has generally prevailed. Especially noteworthy has been the increasing involvement of hourly employees in a broad range of decision-making areas affecting their safety (Figure 2), some of which go beyond the conventional view of 'safety' matters.

Figure 2 lists 18 safety and hazard management decision-making areas, ranging from work planning, to clothing and equipment selection, to education and training, and to safety inspections and investigations, in which Whonnock employees now participate to varying degrees (from no input to shared responsibility). The figure also shows consensus results from a 1985 survey of both hourly employees and foreman, in which respondents were asked to rate both the actual existing, and desired, level of employee involvement in decision-making.

The information in Figure 2 is noteworthy from a number of standpoints. One key observation is that employee participation at Whonnock has been implemented to a degree where employees now directly influence or share responsibility in 16 of 18 major areas of safety program decision-making. Secondly, both employees and foremen appear to share the view that the level of employee participation should be further expanded, to a point that employees are at least consulted in all areas including long term work planning, and are given shared responsibility in 14 of the 18 specified areas. Finally, it appears that sole responsibility for safety decision-making does not represent a desired employee objective, an observation which underscores the point that the participatory approach typically leads to constructive and cooperative sharing, not preemption, of managerial power and authority.

Management Involvement. Safety and hazard management clearly is a two-way process. The effectiveness of employee involvement has depended very critically upon the active involvement in safety matters by supervisors and managers: to listen and respond to employee concerns, to set an example by their own safety practices on-the-job, and to exercise leadership by their attention to safety in the planning of work and the supervision of employees. Excellence in safety has become the standard for performance among Whonnock managers.

Follow-Up Action, Trust, and Communication. These factors represent outcomes of greater employee and management involvement in safety, and they also represent key factors in themselves. The main difference from the past is that more safety problems have been dealt with more quickly and effectively.

What is remarkable in many of the Whonnock logging operations is the openness of communication on safety matters, among employees, and between hourly employees and management. This willingness to communicate has been essential to the identification and solution of hazards on-the-job.

Better Planning. Work planning has been, and will continue to be, a key factor in improving safety. Employees identify it as one area in which they would like to become more informed and involved. An important aspect of safety in relation to planning of operations has been the involvement of company foresters and engineers. In one project they have consulted with employees and supervisors in drafting engineering guidelines for safer logging.

Leadership Development and Safety Education Workshops. Separate workshops have been held each years since 1983 for each of four groups within Whonnock: (1) Safety committee chairmen and senior employees; (2) Union representatives; (3) Foremen; and (4) Superintendents and managers. Employees regard the workshops as especially important in developing awareness of their own duties in safety, and in improving their ability to lead and train fellow employees on-the-job. The workshops have highlighted management's commitment to safety, and have provided a unique opportunity for employees and supervisors from the various Whonnock operations to learn from each other's experience. The workshops for employees have also featured the participation of I.W.A. officers.

Future Directions

At the end of 1985, Whonnock management, after consultation with employees, supervisors, and I.W.A. officers, established an agenda for sustaining the company safety effort. Success in sustaining the program was seen to be based upon: (1) program maintenance (i.e., updated first-aid training); (2) support systems (i.e., safety education and information, performance feedback); (3) program coordination and evaluation; (4) leadership (i.e., renewed objectives, attention to safety); and (5) expansion of employee involvement (into other aspects of the logging operations, such as production planning and quality control).

For a participative approach in safety to be sustained, it needs to comply and be substantially consistent with the larger, continuous context of day-to-day decision-making in company operations, and with the long-term planning process of the company. Otherwise, 'participation' in safety will be discredited, and ultimately rejected, by a more traditional authoritarian or bureaucratic organizational structure, much like a transplanted organ can become alien to its receiving body. Fortunately, the managers and employees within Whonnock, from their experience with the safety program described in this report, have learned a great deal about the

nature of employee involvement. They now know more about its limits, its potential, and its requirements. They also have learned more about themselves, their values, their concerns, and their skills. Above all, they have discovered that they must continue to learn about safety and participation, and about how to bring about change in themselves and their work. In our judgement, their ability to sustain what they have achieved will likely depend most upon their ability to change and to deal with change.

CONCLUSIONS

From a behavioral cybernetic perspective, effective organizational safety and hazard management programming represents a behavioral and human factors, not a technical engineering, problem. Thus, Smith (1980) notes that no more than 20 percent of industrial accidents in the U.S. could have been avoided by rigorous industry compliance with standard governmental safety regulations, which are based almost exclusively on technical specification standards. Safety statistics cross North America clearly indicate that occupational accidents and injuries continue to represent a major economic, social, and health burden to society, and that the situation is not improving.

The participatory approach is based on the fundamental behavioral cybernetic principle that those most directly affected by workplace hazards, the employees themselves, should be given direct opportunity to participate in making decisions regarding how those hazards are managed in relation to work operations. We believe that this approach represents a highly promising strategy for bringing about substantive improvements in safety across all organizatrional and industrial sectors. The experience of Whonnock Industries described in this report represents one of the few examples in which beneficial and substantial improvements in industrial safety can be attributed directly to the introduction and implementation of a meaningful participatory safety and hazard management program based on employee involvement. It is noteworthy that the Whonnock program embodies a number of the theoretic systems principles of safety and hazard management outlined in the first part of this report, namely a behavioral cybernetic design, an emphasis on hazard control, attention to ergonomic/human factors aspects of safety (exemplified by a number of the areas specified in Figure 2), promotion of self-regulation and employee participation, and integration of safety with production.

Of course, we cannot prove that if the program had not been introduced, the improvements experienced by the Whonnock Forestry and Industry Group would not have occurred. However, there is no question in the minds of Whonnock employees and managers directly involved that the program itself brought about the beneficial results that were observed. This belief alone represents a critical feature of program acceptance and success. We suggest that the Whonnock record provides strong testimony for the view that the human factors approach to organizational design and management, centered on the behavioral cybernetic principle of employee participation, constitutes a compelling model for future development of safety and hazard management programs.

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Figure 1

Forestry and Logging Safety Statistics, 1982 to 1985.
Whonnock versus Total B.C. Industry
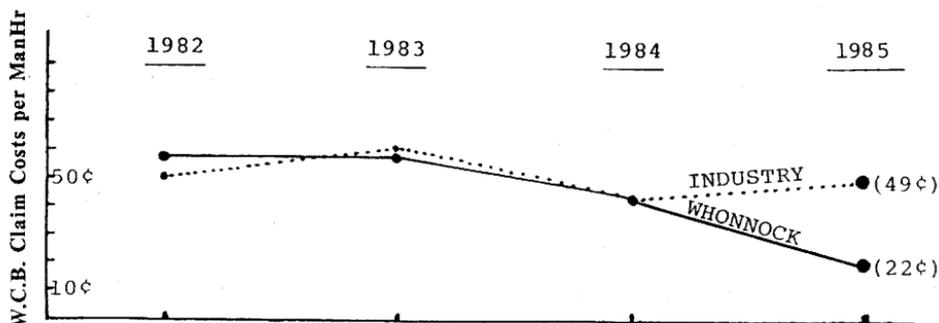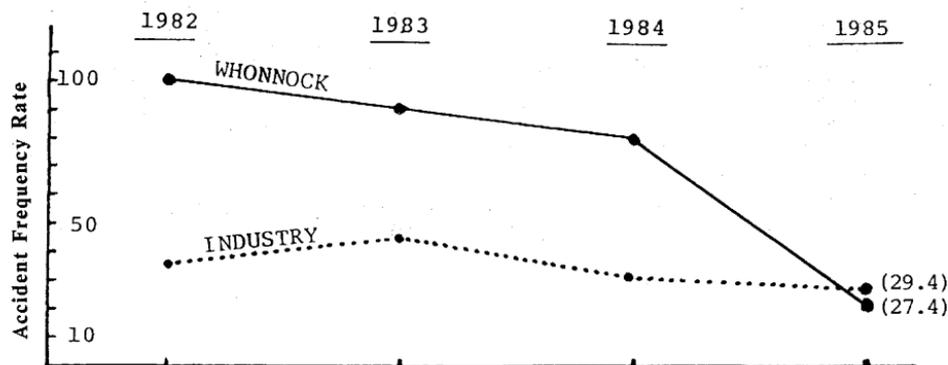
Source: B.C. Council of Forest Industries

Figure 2

Consensus Opinions of Whonnock Employees and Supervisors About the Actual (X) and Desired (▷) Degree of Employee Involvement in Decision-Making

	NO INPUT	INPUT	INFLUENCE	SHARED RESPONSIBILITY	SOLE RESPONSIBILITY
Short-Term Planning of Work			X--▷		
Long-Term Planning of Work	X-----	--▷			
Housekeeping of Worksite				X--▷	
Protective Clothing - Selection			X------▷		
Use				X▷	
Induction of New Employees			X--▷		
Tools & Equipment - Selection		X------	--▷		
- Maintenance			X-------	-→ ▷	
Training			X------▷		
Correction of Unsafe Acts				X---→ ▷	
Correction of Hazardous Conditions				X▷	
Work Rules & Standards			X-------▷	▷	
Safety Promotion & Education			X-----	-→ ▷	
Safety Inspections			X------	-→ ▷	
Accident Investigations			X------	-→ ▷	
Labour-Management Safety Committee				X▷	
On-the-job Employee Supervisor Communication			X-----	-→ ▷	
On-the-job Communication amongst Crew				X-→▷	

*Based on responses completed anonymously by a sample of hourly employees and foremen from each operation.