

**"Our research activities
are dictated by the
needs expressed to
us by the working
community."**



IRSST
Institut de recherche
en santé et en sécurité
du travail du Québec

505, boul. de Maisonneuve Ouest
Montréal (Québec)
H3A 3C2
Tél.: (514) 288-1551
Fax: (514) 288-7636

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IRSST → 1994 Annual Report

Research, the key
to understanding

Mission and goals

The Institut de recherche en santé et en sécurité du travail (IRSST, Québec Occupational Health and Safety Research Institute), created in 1980, is funded by the Commission de la santé et de la sécurité du travail du Québec (CSST, Québec Occupational Health and Safety Commission). Its mission is to contribute, through research and development, to the improvement of worker health and safety, and more specifically, to the elimination at source of hazards for workers' health, safety and physical well-being, and to the rehabilitation of workers having suffered occupational accidents or diseases.

To fulfil its mission, the Institute:

- conducts, funds and contracts research that responds to the needs of the CSST and the working community
- communicates the results of its research and consulting activities to the working community
- awards graduate scholarships in occupational health and safety
- under the terms of a contract with the CSST, provides the Québec public health and safety prevention network, the CSST, and joint sectoral associations with essential laboratory and consulting services.

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Laboratory services

In 1994, the Laboratory Division carried out approximately 48 000 environmental and toxicological analyses and provided over 50 000 hours of instrumental services for the CSST's prevention network. The Laboratory Division also performed approximately 2 000 additional analyses and provided approximately 300 hours of service for research projects.

Over 98% of the analyses were done for CLSCs and regional public health boards for the purpose of establishing health programmes for businesses in high-priority industries.

Organic compounds accounted for 50% of all analyses, metals and ions 10%, dust 10%, toxicological analyses 23% and miscellaneous analyses 7%.

Besides performing over 225 types of analyses, the Laboratory Division calibrates, maintains and repairs equipment used by members of the prevention network to sample air contaminants and measure gas concentrations and physical parameters such as noise.

The Laboratory Division's clientele is not limited to members of the CSST's prevention network, and in 1994 included employer groups, unions, companies, and various other organizations.

Publications

In 1994, the Institute published 32 documents, including 16 research reports and technical guides. The Communications Division distributed almost 20 000 documents on health and safety, either in response to specific requests or at events such as symposia, conferences and exhibitions.

Subscriptions to L'IRSST increased by 18% and now stand at almost 5 400. The feature articles in 1994 were:

Rehabilitation and social reinstatement of workers having suffered occupational injuries (Spring 1994).

Hazards associated with metal presses, and a new safety system to protect billboard workers from falls from heights (Summer-Autumn 1994).

New prevention guides for microbial proliferation in ventilation systems, air and biological monitoring sampling guides (Winter 1994).

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The Institut hands it to **you**

Without our relayers, workers and companies are unable to benefit from our research.

Widespread consultation and planning were the hallmark of the Institute's past year. Even though most of our research is triggered by requests from the working community and conducted in collaboration with it, it is incumbent on us to consult our clients periodically, to ensure that we are aware of all their expectations. To this end, we asked employer groups, unions, the CSST's central and regional offices, and the public health network to tell us what they need in terms of occupational health and safety research. In addition, this type of consultation is conducted on an ongoing basis with joint sectoral associations. The results of this vast consultation will help the Institute make its programmes even more relevant and ensure that it continues to act where it counts.

The year was also marked by the beginning of joint strategic planning with the CSST. The results of this approach should improve the complementarity of each agency and increase their synergy.

The Institute's mandate is to produce high-quality scientific results that meet the needs of the working community. Happily, the scientific credibility of IRSST researchers is well established. However, in order for new knowledge to benefit all workers and companies, it is necessary for relayers to lend their

hand. Relayers are anyone who, by virtue of their mandate or function, is capable of action in their work environment. This includes health and safety representatives in companies, members of health and safety committees, employer and union representatives, joint sectoral associations, employer and union associations, and public health and social service boards.

The Institute's mission is thus intertwined with that of its relayers, without whom employers and workers, the Institute's ultimate clients, would be unable to benefit from our work. On behalf of the Institute, I thank all of them for their efforts.

Pierre Shedleur, President

Financing

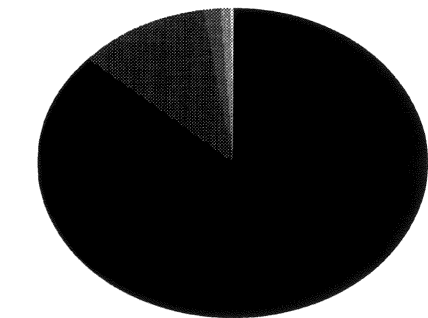
The Research Applications Transfer Department develops expertise related to the application of research results, supports efforts by research teams to apply their results, develops strategies favouring the application of the results of Institute research and collaborates in their application. It also sees to the marketing of products and processes resulting from Institute research.

The Communications Division is responsible for the dissemination of information about the Institute and its priorities, orientation, research and other activities. It prepares institutional publications, publishes research material, communicates with media and acts as a resource for the Institute's other divisions and programmes.

The Administrative Services Division is responsible for human, financial, and material resources, and for industrial relations.

The Computer Services Division is responsible for the development and management of the Institute's computer systems.

The IRSST's total revenue in 1994 was \$17,785,284, including a grant of \$15,403,000 from the CSST. Expenditures totalled \$17,411,265.

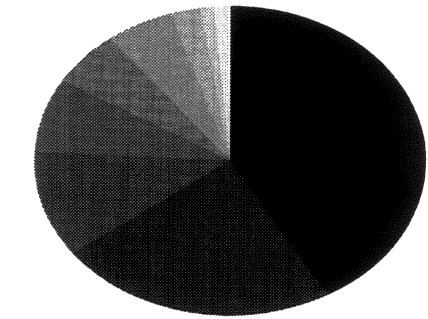


(revenues: \$17,785,284 = 100%)

| | | |
|---|------------------------------|--------------|
| ● | CSST | 86.6% |
| ● | Laboratory services | 11.0% |
| ● | External contracts | 1.3% |
| ● | Interest | 0.9% |
| ● | Miscellaneous revenue | 0.2% |

Personnel

The Institute has had the good fortune to have a stable workforce in recent years. In 1994, the Institute employed 130 people. University diplomas are held by 67% of Institute personnel. Of these, 25% have a doctorate, 46% a master's degree, and 29% a bachelor's degree.



(expenditures: \$17,411,265 = 100%)

| | | |
|---|---|--------------|
| ● | Internal research | 41.6% |
| ● | External research | 23.1% |
| ● | Laboratory services | 11.1% |
| ● | Administration | 7.7% |
| ● | Scientific administration and coordination | 6.0% |
| ● | Communications | 5.4% |
| ● | Computer services | 2.4% |
| ● | External contracts | 1.4% |
| ● | Technology transfer | 1.3% |

Administrative report



Organizational structure

The General Executive is responsible for the overall management of the Institute. This mandate includes the formulation and implementation of policies, particularly those related to leadership, presentation, development and coordination of research in occupational health and safety in Québec, and communication of research results. The Secretariat assists the Director General and is responsible for ensuring that the meetings at the Institute's various decision-making and advisory committees run smoothly.

The Scientific Executive assists the Director General in the formulation and evaluation of the Institute's research activities. It is also responsible for maintaining links with the CSST, joint sectoral associations, the working community, and other scientific organizations, for the Institute's scientific life and its scientific documentation.

The External Research Directorate is responsible for the IRSST's relations with universities and other competent research organizations that perform research in fields it judges relevant and of high priority. It also manages funded and contract research programmes and the graduate scholarship programme.

The Laboratory Division is responsible for the administrative and scientific management of the Analytical Support, Industrial Hygiene and Toxicology, and Safety Engineering programmes, all of which provide laboratory and consulting services, and perform research and development. The External Users Liaison Group manages requests for laboratory and consulting services, most of which come from CSST inspectors, hygienists from local community service centers, regional public health boards and joint sectoral associations (ASP, Association sectorielles paritaires).

Research in the Safety Engineering Programme is aimed at reducing or eliminating hazards, especially in the fields of industrial machines, protective equipment, and noise and vibration.

The Industrial Hygiene and Toxicology Programme carries out environmental and toxicological analyses, provides the CSST and the rest of the occupational health and safety prevention network with the necessary expertise in this field, and conducts applied research in industrial hygiene and toxicology.

The Analytical Support Programme conducts research and development in industrial hygiene, provides expertise in this field and maintains, repairs and calibrates all the industrial hygiene equipment used by the CSST and its prevention network.

The Work Organization Programme performs research that examines the effects of social, organizational and human factors on occupational health and safety in the context of social and technological change, and characterizes the dynamics of the occupational reinstatement of accident victims. The team also develops new statistical indicators to help establish priorities and justify and understand projects.

The Safety Ergonomics Programme conducts applied ergonomic research aimed at reducing occupational accidents and diseases. The primary research focus is on workstation analysis and design, and on risk factors for cumulative trauma disorders.

Director General's report



Listening to **clients**

In 1994, we strengthened our ties with our clients and took extra care to ensure that our research responds to their needs.

The Institute's research activities have been largely determined by the requests it received from the working community and the CSST. This has strengthened the relevance and quality of our projects and necessitated certain procedural modifications. Rather than simply reacting to research proposals, the working community and the CSST are now taking the initiative of asking the IRSST to resolve health and safety problems in their companies, industrial sectors, associations, and regions.

The IRSST is particularly well placed to respond to such requests, as they are concentrated in areas in which we have already established considerable research expertise. The new, more direct manner of formulating research requests has resulted in new internal procedures. Requests are analyzed and documented, and their scientific feasibility evaluated. The next step is to find partners the most likely to guarantee the transfer or general application of results to other companies or entire industrial sectors. Even our consultation projects are carried out in collaboration with the original requesters. Although this new approach renders project preparation more demanding, the projects are more effective since the results are more directly applicable.

The requests received by the Institute are concerned with very specific problems and their resolution may require in-depth research and the development of new knowledge. However, a research institute must also perform prospective research and prepare itself to face emerging problems. We must therefore strike a balance between solutions to specific problems and activities with medium- or long-term, but nevertheless real, benefits.

The close collaboration begun with the CSST and the working community in 1994 can only improve the relevance of our responses to the needs expressed to us, and thus improve accident prevention.


Jean Yves Savoie, Director General

Highlights



Research

Research and expertise that's relevant

As the agency responsible for the collection, articulation and coordination of research that satisfies the needs of the working community, the IRSST plays a unique role in Québec's vast prevention network.

Positioned at the intersection of the research and working communities, the IRSST has a long-standing commitment to strengthening the relations and interactions between these two worlds. From its initial role as a source of funding, the Institute has rapidly evolved into a true coordinating body, transposing the working community's needs to a precise research framework. To do this, it regularly consults its clients in the prevention network and the workplace.

1994: A useful consultation

The most recent of these consultations, initiated in 1994 by the Institute's president, revealed that the Institute's research programme (see box) clearly responds to the needs expressed in the over 200 requests for research received.

It is important to note, however, that not all requests necessarily lead to research projects. When sufficient information exists about a given problem, responses can take the form of selective consultations or transfers of knowledge. Furthermore, the relevance and priority of all research projects is first evaluated by a committee comprising both employer and union representatives.

The 1994 consultation revealed a concentration of research needs in six fields, to which the Institute has accordingly allocated the bulk of its resources – something which it will continue to do in 1995, following appropriate adjustments.

The year in six fields

Back problems

Two major projects on the evaluation and diagnosis of back problems were completed in 1994; the results of these will be published in 1995. The use of mechanical handling aids was also studied, and, as part of the CSST's job-maintenance programme, the foundations were laid for the development of a programme on the modification of dangerous workstations.

Cumulative trauma disorders (CTDs)

In 1994, an international team of experts finished a literature review destined to become a standard reference for the understanding and prevention of CTDs. The Institute also provided support for the CSST's CTD-prevention programme. Finally, the refinement of a model for the prevention of CTDs was one of the high points of the past year.

tion and exclusive distribution rights for the range-limiting device for fixed-boom mobile cranes, a double-action mechanical system that prevents mobile cranes from coming into contact with live electrical wires. The system was developed by Joseph-Jacques Pacques and his colleagues in the Safety Engineering Programme.

Thanks to another agreement concluded by the RATD, Cogicom Informatique inc. will be marketing an integrated laboratory management system capable of processing requests, data entry, invoicing, analyses, calibration, maintenance of analytical instruments, and sample management. Originally developed in response to the needs of the Institute's laboratories, the system can be adapted to meet the requirements of other analytical laboratories.

The RATD also collaborated during the past year with the Joint Sectoral Association, Social Affairs Sector to help determine design criteria for tractors used to manoeuvre food

and laundry carts in hospitals. Following evaluation of potential manufacturers, the production of a prototype tractor was awarded to BHM Médical inc. of Magog. The prototype will be validated in hospitals before being produced commercially.

Yet another example of collaboration is afforded by the RATD's search for producers of moulded polyester resin products, as part of the validation process of the RTMFLOT software package developed by Raymond Gauvin of the École Polytechnique de Montréal in the course of Institute-funded research. Using the software, which reduces styrene emissions, moulds were designed to the specifications of five companies that had volunteered to test the new process.

Early in 1995, the RATD had 42 active projects, of which 26 involved knowledge and technology transfer, and 16 follow-ups of marketing and research and development agreements with industrial partners.

Events

Occupational Health and Safety Week, held between October 17-21, 1994, was marked by an exhibition in Montréal at which the Institute presented six studies performed either internally or as funded research. Several IRSST and external researchers were on hand to answer questions from the public on their research.

The launch of the "Guide de prévention contre la prolifération microbienne dans les systèmes de ventilation" (Guide for the Prevention of Microbial Proliferation in Ventilation Systems) in Montréal last December was marked by a press conference attended by 40 representatives of associations preoccupied by indoor air quality in non-industrial buildings. The coverage of this event by the print and electronic media was no doubt responsible for the numerous requests for the guide the Institute received after the press conference.

During the sixteenth convention of the Association pour l'hygiène industrielle au Québec (AHIQ, Québec Association for Industrial Hygiene), held May 4-6 in Québec City, the Institute's mini-museum of industrial hygiene drew the attention of participants. Comprising over 100 photographs and instruments, the exhibition traced the history of hygienists and their equipment through the themes of air, dust, asbestos, vapours and noise.

The participation of Institute personnel in technical and scientific committees serves two purposes. Firstly, contacts with experts in key fields ensures access to scientific and technical information essential to the execution of the Institute's ongoing mandates. Secondly, these activities help maximize the concrete impact of Institute research among its Québec partners.

In 1994, members of the Safety Engineering Programme responded to approximately 30 requests for expertise. Most of these came from companies (employers and workers), joint sectoral associations, and the CSST, and were satisfied by short-term ergonomic interventions or selective counselling. This past year also saw the formalization of acceptance criteria and response procedures for requests for consultation.

Courses given by Institute personnel to members of the public health network constitute another type of consulting activity. Particularly noteworthy was the course on measurement techniques for electromagnetic fields given by Lambert Laliberté during the

Technology transfer and communication of results

In 1994, the Institute's Research Applications Transfer Department (RATD) negotiated five marketing agreements with private-sector partners, for systems and tools developed during the course of Institute research activities.

Under the terms of one of these agreements, the Québec firm UltraOptec has acquired production and worldwide distribution rights for a portable monitor for low-frequency electromagnetic fields. This device, developed by Lambert Laliberté and Bernard Caron of the Analytical Support Programme, measures the intensity of electromagnetic fields of 50-750 Hz generated by both monophasic and triphasic currents.

annual convention of the Association pour l'hygiène industrielle du Québec's (AHIQ, Québec Association for Industrial Hygiene) (Québec, May 3, 1994), and the course on practical tips for the use of industrial hygiene equipment, given by Brigitte Roberge and Yves Beaudet. The latter course was given once in Québec and twice in Montréal to representatives of the public health network, at the request of the Ministry of Health and Social Services.

As part of its vast research programme on occupational biological hazards, the Institut national de recherche et de sécurité (National Research and Safety Institute) of France has expressed interest in the IRSST's expertise in this field. In December 1994, Jacques Lavoie, hygienist with the Analytical Support Programme, was invited by the INRS to present IRSST work in this area since 1987.

It should also be noted that this year, as in previous years, Institute researchers participated in conferences and events organized for the working community.

Two agreements were concluded with Omega Specialty Instrument. The first concerns the production under licence and distribution of isocyanate sampling cassettes. Developed by Jacques Lesage and Guy Perrault of the Institute, these cassettes allow the physical nature (gas vs aerosol) of isocyanates present in the environment to be characterized. The second agreement concerns the gravimetric cell developed by Jaime Lara of the Safety Engineering Programme. With this cell, companies may inexpensively evaluate the resistance of protective clothing to volatile chemicals.

Under the terms of yet another agreement, Systèmes électroniques Rayco inc., a Québec company specializing in the production of range-limiting devices, has acquired produc-

Chemical and biological contaminants

The Institute continued its ongoing commitment to supporting industrial hygiene field workers. The workplace environmental monitoring guide was updated and a number of direct activities, described in the Consulting section, were also conducted.

Hazardous tools, machines and industrial processes

In this field, a conceptual framework which allows analysis to go beyond simple "case by case" studies was refined. Drawing on concepts from the field of simultaneous engineering, the approach allows health and safety factors to be taken into account during the design of industrial processes and machines.

Protective equipment

In 1994, the Institute's activities in the field of protective equipment resulted in the consolidation of its expertise in fall-arrest devices, protective gloves, and chemical cartridges. These activities also afforded Institute scientists numerous opportunities to provide expertise to the working community.

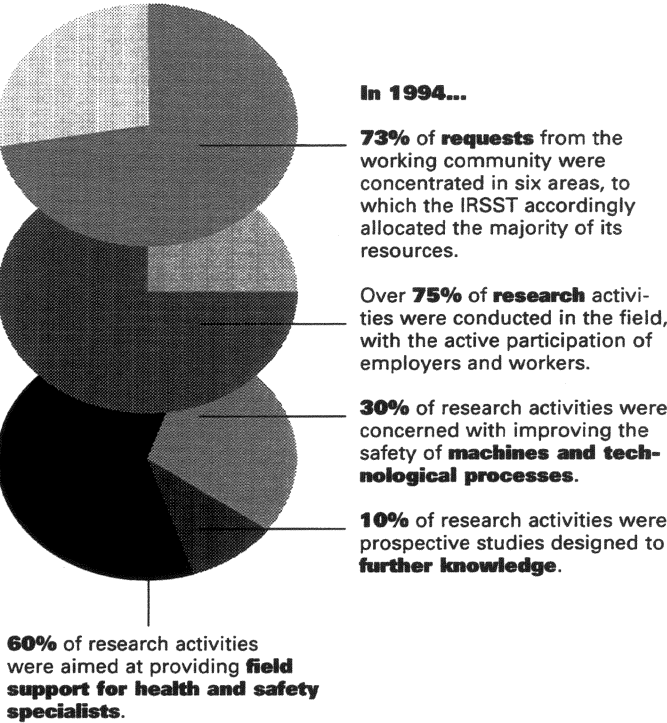
Noise

The improvement of workplace safety through the development of more effective acoustic alarms was one of the most important achievements of the Institute's activities in this field in 1994. Thanks to this work, it is now possible to optimize the effectiveness of this type of alarm, which favours the job-maintenance of hearing-impaired workers.

In 1994, 130 research and consulting projects were conducted by internal research teams, or, through funding or contracting agreements, by external researchers. Of these, 38 were begun, 47 continued throughout the year, and 44 were completed.

In 1994, the Institute provided funding of \$7,249,189 to its internal research teams and \$3,523,224 to external researchers. This includes over \$330,000 awarded to 26 students by the IRSST's Graduate Scholarships Programme.

Our first priority: the working community's needs



Concrete results

Back problems

A private-sector firm asked the Institute to solve a problem involving its cement-mixer operators. Approximately 60 companies will benefit from the results of this study.

Back problems, shoulder pain, finger and hand injuries and accidents associated with the handling of cement chutes account for almost half the work-days lost by the approximately 1 200 cement-mixer operators in Québec.

In order to solve this problem, the Groupe Béton Québec, which employs 180 workers, asked the IRSST to help design a lighter

chute. In collaboration with the Centre de recherche industrielle du Québec (CRIQ, Québec Industrial Research Centre), Institute ergonomists analyzed the different handling techniques used by operators, and, through interviews, collected information on the activities operators considered the most dangerous.

Several risk factors were identified by this study, conducted in the field in close collaboration with management and workers, and the company has successfully implemented a number of recommendations concerning mechanical improvements and improved maintenance procedures.

Follow the guide

Cumulative trauma disorders

The Association paritaire pour la santé et la sécurité du travail du secteur de la fabrication de produits en métal et de produits électriques (Joint Sectoral Association, Metal Products and Electrical Products Fabrication Sector), both an IRSST research client and relayer of research results to companies, has adopted the participatory ergonomics approach developed by the Institute. This approach to ergonomics allows workers and management to take their health and safety problems in hand.

A 1988 survey conducted by the Joint Sectoral Association, Metal Products and Electrical Products Fabrication sector revealed a preoccupation among Association members with cumulative trauma disorders (CTDs). Soon after, the Joint Sectoral Association asked the Institute to study this problem and propose solutions.

The initial project, conducted in transformer and household appliance factories, established the frequency and severity of CTDs. Led by Marie St-Vincent, the Institute's research team used a participatory ergonomics

approach to develop a guide for the analysis of workstations by groups of workers and employers with no training in ergonomics. This gave the working community a tool with which to analyze hazardous workstations and develop solutions that take variations in the physical characteristics of workers and production conditions into account.

A second project, in progress in two other companies, will validate the approach, which is based on the analysis of workstations by groups of employers and workers trained in the use of the guide.

Consulting

The Institute's consulting activities in 1994 were marked by the publication of three eagerly awaited guides which the Institute's clients and intermediaries will find very useful in daily workplace environmental monitoring operations.

The first of these guides, on the prevention of microbial proliferation in ventilation systems, is addressed to building managers, ventilation system designers, and health and safety specialists. The guide proposes an effective preventive maintenance method for ventilation ducts and complements the "Stratégie d'étude de la qualité de l'air dans les édifices à bureaux" (Strategy for the Study of Indoor Air Quality in Office Buildings) published by the Institute in 1989. More specifically, it describes concrete measures to eliminate microbial proliferation at their source, and defines inspection, maintenance, control and cleaning procedures. A model specification sheet for cleaning contracts is also included.

The second guide, on the sampling of airborne contaminants, is much more than the regular biennial update normally published by the Institute. The number of contaminants covered by the guide has increased from 225 to 674, and now includes all the substances listed in Appendix A of the revised Regulation on the Quality of the Work Environment. Sampling methods are defined for each new contaminant, and the sampling and analytical methods for existing contaminants have been reviewed and brought into line with the Regulation's new requirements. The updated guide is a unique reference for all the contaminants covered by the Regulation.

The third guide prepared in 1994 addresses the collection and interpretation of biological monitoring data and is entitled "Guide de prélèvement des échantillons biologiques" (Guide for the Collection of Biological Samples). The Institute has added a series of reference sheets to help occupational health specialists interpret biological monitoring data. In addition to the list of all the analyses

available from the Institute included in previous versions, the guide also contains a list of third-party analyses available from the Institute, and a review of the scientific basis of the interpretation of the results of biological monitoring.

Last autumn, the quality of the IRSST's Laboratory Division's analyses was recognized by an official Canadian agency when the Division's acoustic measurement section received Canadian Standards Association accreditation as a national reference laboratory. For IRSST clients, the most visible benefit of this accreditation will be the provision of a calibration certificate indicating the expected precision of equipment in the field and their conformity to manufacturer's specifications. The inclusion of accreditation requirements in the IRSST's calibration guides ensures the highest quality service to our clients.

In addition, committees reporting to the CSST's Board of Directors have been well served by the IRSST's scientific expertise. The IRSST was represented by Nicole Goyer, Alain Lajoie, Jean-Guy Martel, Guy Perrault, and Henry Scory, all of the Laboratory Division, on various committees mandated to update the Regulation on the Quality of the Working Environment and the Regulation concerning Occupational Health and Safety in Mines.

The participation of the Laboratory Division's scientific personnel in Canadian Standards Association (CSA) committees should also be noted. The following Institute personnel sat on CSA committees: Jaime Lara, on the committee for the standardization of protective footwear used by firefighters; Jean Arteau, president of the technical committee on fall-arrest devices; Serge Massé, on the technical committee on mobile forestry equipment, and the committee on machine safety; Joseph-Jean Pacques, on the committee for the development of a safety code for industrial robots; and Esther Cloutier, on the committee responsible for the development of an information system for use in the prevention of occupational accidents.

A sound idea

Tool, machine and process safety

Although the research project originates from a researcher, rather than the working community, it stands to benefit the entire mining industry. Initially developed to assess the stability of large dams, the “instrument cylinder” is now being used to prevent mine accidents.

In order to improve the assessment of the stability of large hydroelectric dams, Gérard Ballivy of the Université de Sherbrooke refined existing devices and developed the “instrument cylinder», a concrete cylinder equipped with six vibrating-wire strain gauges. Once inserted into the rock wall, its data-processing module records and interprets wall movement, allowing wall deformation in all three dimensions to be measured.

It was only after the device had been validated on large-scale engineering projects that Ballivy received IRSST funding for the application of the cylinder to the measurement of the stability of mine pillars and underground rock walls. The installation of seven cylinders

connected to two computerized alarm systems at the Niobec mine demonstrated that the instrument cylinder reacts well to strains occurring in underground mines and could therefore prove useful for the prevention of accidents in this sector. In another field trial, co-funded by other agencies, the cylinder was installed in the underground walls of an experimental nuclear waste storage site in Pinawa, Manitoba.

The researcher has also developed a data collection and analysis system which is more robust than currently available models. This renders the continuous monitoring of rock-wall stability possible, even during large-scale dynamiting.

A platform

Tool, machine and process safety

that’s a step above

An IRSST study identified and described the hazards associated with domestic waste collection. To provide the industry with practical solutions, the Institute had one of its researchers modify the layout of garbage trucks. Initial validation of this design was conducted with the collaboration of the City of Montréal and the union of blue-collar workers.

One of the key findings of the initial research was the need to modify the hopper loading station on rear-loading trucks and improve cabin access, both of which are associated

with falls and slips responsible for musculoskeletal injuries. The Institute asked Ergo-Norme inc. to improve the design of these workstations.

Using data collected during observation of actual waste collection work, the rear platform was modified in order to provide workers with more hand-holds for use during mounting or dismounting, thus reducing the risk of injury by collision, falls, or slipping. The trials were conclusive and the City of Montréal intends to progressively modify all of its approximately 80 trucks. These modifications are also being validated in a private-sector company with different working conditions.

Listening to industry

Noise

No less than 11 joint sectoral associations, 6 employer associations and 250 companies collaborated on a vast survey on noisy tools. The survey resulted in the establishment of the first directory allowing users to use the acoustic performance of tools as a purchasing criterion.

In 1991, the Institute asked researchers at the Université de Sherbrooke’s Groupe d’acoustique et de vibrations (GAUS, Acoustics and Vibrations Group) to analyze the needs of users of mufflers, blowers and compressed-air guns, devices that are generally considered excessively noisy. In all, 220 models of mufflers, blowers and compressed-air guns were inventoried and 135 different models tested in the laboratory. This research called for the development of new test methods for the acoustic effectiveness and mechanical characteristics of these noisy tools.

In 1994, the Institute published “Répertoire des silencieux, soufflettes et pistolets d’air comprimé” (Inventory of Mufflers, Blowers and Compressed-air Guns), distributed primarily in the mining, automobile and metal products and electrical products fabrication sectors. This directory will help companies incorporate the performance of these devices into their purchasing criteria.

In other developments, an audiologist at the Montérégie Regional Health Board used the Institute’s directory as the basis for a guide for hygienists, audiologists, engineers and other specialists in this field.

In a muffled tone

Noise

To reduce problems caused by noise in the aerospace industry, a researcher has refined a padding system which muffles vibration generated during riveting. This system is now widely used by a large Québec aerospace company and has attracted the attention of companies in the public transit and avionics sectors.

In response to a request from Bombardier-Canadair, an aerospace company, Maurice Amram of the École Polytechnique de Montréal received Institute funding to study the problem of noise and vibration associated with riveting metal panels.

The original concept was developed by Canadair. It consists of pads applied by suction to the structure to be riveted. The vibration generated by riveting is dissipated

as heat, reducing its transmission. The most effective combination of materials, optimal thickness of the materials, and pad configuration were identified during laboratory studies.

The system has been shown to be both effective and simple to use. The padding system is in wide use at Bombardier-Canadair and could be applied to the construction of trains, buses, ships, tanks, reservoirs, and heat exchangers, and to the control of noise generated by electrical transformers.

Negotiations are currently under way between the Institute’s Service de transfert des applications de la recherche (Research Applications Transfer Department) and a private-sector firm for the distribution of this system in two primary markets: avionics, particularly helicopter repair, and municipal public transit corporations, for the repair of buses.

Let's hear it

Noise

Prevention specialists, audiologists, and rehabilitation counsellors will soon be able to count on a valuable tool. Collaboration between the IRSST, a research team specialized in occupational hearing loss, and ten companies will result in improved worker safety in noisy workplaces.

One of the occupational safety problems encountered by workers suffering from hearing loss is their inability to hear acoustic warning alarms against high levels of background noise. In some cases, high levels of ambient noise and reverberation may even render the alarms inaudible to individuals without hearing loss.

The Institute's Service de transfert des applications de la recherche (Research Applications

Research Unit) and the Université de Montréal's Groupe d'acoustique (GAUM) wish to demonstrate that it is possible to ensure that all workers, whatever their hearing capacity, can detect acoustic alarms in noisy workplaces.

The team will use the Detectsound™ software package, developed by GAUM in a previous Institute-funded project, to characterize acoustic warning alarms in ten companies with noisy environments, taking into account background noise levels at workstations, the hearing capacity of workers, and the use of hearing protection.

If the results of this project are positive, they could prove useful not only to the companies involved but also to prevention specialists, CLSC counsellors, regional health departments, and CSST rehabilitation counsellors.

Fruitful strategies

Work organization

Musculoskeletal disorders (CTDs and back problems) and psychosocial problems caused by production pressure and stress are the main health problems encountered in the garment industry. The workforce in this sector is not highly skilled and most of the workers are women. The work is manual, repetitive, very physically demanding, performed on assembly lines, and requires workers to maintain fixed postures. As with all piece-work, earnings are directly dependent on production. In general, working conditions have remained unchanged for a long time.

Marguerite-Michelle Côté and Danièle Champoux of the Work Organization Programme conducted an exploratory study of work in this sector. Through interviews and systematic observation of the production processes, they demonstrated that when

significant organizational change is absent, workers develop strategies to adapt to health and safety problems. These include cooperation between workers, worker-employer collaboration or confrontation, and individual strategies. Companies in which

employers and workers collaborate appear to have better health and safety records and working relations.

The primary goal of the adaptive strategies is the resolution of daily problems through workstation modification. Several different approaches were observed, including the

installation of rubber carpets, adjustable tables, individual lamps, conveyors, and rolling baskets. All management levels may be involved, and these companies sometimes rely upon outside resources, such as consultants, the CSST, and especially the garment industry's joint sectoral association.

An effective solution

Tool, machine and process safety

to the problem of crane operator electrocution

To find a solution to the serious problem of mobile cranes coming into contact with live electrical wires, the Institute – in collaboration with the CSST, the Construction Sector Joint Sectoral Association, companies, and workers – conducted research and field trials of a range-limiting device, which will be marketed shortly.

Between 1974 and 1989, at least 79 Québec workers were victims of a serious accident caused by the contact of a mobile crane with live electrical wires. Towards the end of the 1980s, CSST inspectors, in search of tools with which to evaluate the effectiveness of existing safety devices, asked the Institute to undertake research in this field.

The initial analysis of accidents revealed that electrocution can result from the contact of cranes, truck booms, and the masts of concrete pumps with electrical wires. The Institute's first goal was the development of a simple range-limiting device for fixed-boom mobile cranes. This project was directed by the IRSST's Joseph-Jean Pacques, in collaboration with the Centre de recherche industrielle du Québec (CRIQ, Québec Industrial Research Centre), with the support of the Construction Sector Joint Sectoral Association.

The device was produced, laboratory-tested, and installed on a crane provided by a contractor. Field trials demonstrated the value of the proposed technology, but also highlighted operational limitations related to crane operators' difficulties in judging distances and to the crane's rotational braking force. A safer method of judging distances was developed after further experimentation conducted in collaboration with the joint sectoral association and 16 crane operators.

The Institute has negotiated an agreement with Systèmes électroniques Rayco inc., a Québec company, for the production and distribution of a range-limiting device for fixed-boom mobile cranes. The Institute is currently working with the CRIQ on the adaptation of the device to the distribution masts of concrete pumps, for which no device exists.