Loss Management Information System

Teaching students how to make better management decisions

By Philip E. Rivers

WHAT INFORMATION SHOULD BE COLLECTED about loss incidents? How can that information be used to make decisions to prevent loss incident recurrence? These are questions SH&E professionals discuss each day.

Safety sciences students at Indiana University of Pennsylvania are prepared to enter such discussions thanks to their experiences in a senior-level management course: SAFE 412, Hazard Prevention Management. Imagine students being able to make simulated business decisions using loss incident cause and cost information they can retrieve and manipulate from a computerized database. The four-credit course requires 3 hours of classroom work and 3 hours of laboratory work each week for a semester. The foundation for the laboratory work is a computerized loss incident software program called Loss Management Information System (LoMIS).

The program was developed specifically for this course and was tailored for a fictitious company named Tubing World, a maker of nuclear-grade tubing. Tubing World has two product lines: fuel tubes and cooling tubes. Fuel tubes are made for customers who place uranium pellets into the tubes to make fuel rods for nuclear reactors. Cooling tubes are produced and sold to manufacturers of nuclear power plants for carrying water to cool the reactor core.

With LoMIS, students learn to make management decisions and offer recommendations based on costs to implement their decisions and the benefits derived from those decisions. This article outlines the types of costs used by the program and the types of decisions the students make as part of their laboratory exercises.

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Types of Costs

LoMIS collects and outlays costs that are typically placed in a category called indirect costs, which are usually only estimated because information may be difficult to obtain. In 1926, Heinrich postulated that for every $1 of direct costs (workers' compensation and medical bills) there are $4 of indirect costs. This created the 4:1 ratio that has been often quoted since it was first published (Heinrich 2). The author found a ratio of 17:1 when he used a LoMIS in industry. The reason for the higher ratio is that the program collected costs with great accuracy in all the indirect cost categories, while Heinrich had only cost estimates (Heinrich 51-52).

The program that the students use is based on the LoMIS developed and used by the author while employed in industry. Therefore, all costs used are considered direct because they are measured (Chekanski 65). Of the eight cost categories considered, five are directly measured and three involve an estimation factor.

Directly Measured Costs

The five directly measured cost categories are medical expenses; workers' compensation; parts and equipment replacement; labor to repair; product damage; and fines, fees and settlement.

Medical Expenses

Medical expenses are separated from workers' compensation payments because Tubing World is self-insured and, therefore, pays for all compensation costs. This also allows the company to separate the costs for medical care from the costs of payments to employees. The payments to employees are set by the state, but the costs for medical care can be analyzed for possible cost reduction.

For example, LoMIS collects costs accrued when employees are sent to a physician or to a hospital emergency room, when ambulance services are used, and for medications and medical devices. Accounting tracks these costs by the employee's Social Security number, which is recorded in the document identification section of the loss incident source document (LISD), an electronic investigation report. The following reflects the type of information entered (via fields in the software program) in the document identification section.

LOSS INCIDENT SOURCE DOCUMENT IDENTIFICATION	
Injured's Social Security number	223345212
Purchase order number	PO556784P
Work order number	WO998789

Table 1

Cost Analysis for Lockout Training

LISD	Department	Department	Job Title	Human Factor	Training Problem	Total Cost
20	Production	Cooling Tubes	Pilger Machine Operator	Not locking out	Factor never identified as hazardous	$6,182
120	Production	Fuel Tubes	Pilger Machine Operator	Pre-use inspection	Factor never identified as hazardous	$670
105	Production	Fuel Tubes	Tube Finisher	Operating without proper repair	Factor never identified as hazardous	$550
104	Strategic Services	Maintenance	Electrician—First Class	Repairing without lockout	Factor never identified as hazardous	$1,470
51	Strategic Services	Maintenance	Millwright—First Class	Repairing without lockout	Factor never identified as hazardous	$15,145

Rework tag number	R8875565
Scrap tag number	S9989312
Employee report form number	0

The costs associated with a given employee are placed into fields for medical expenses (4a) and workers' compensation (4b), respectively.

LOSS INCIDENT DIRECT COST CATEGORIES

4a Medical expenses
4b Workers' compensation
4c Replacement costs
4d Labor to repair
4e Product damage
4f Fines/fees/settlement

Workers' Compensation

This category encompasses money paid to an employee who was injured and cannot work, who has a permanent partial disability or permanent total disability, or whose family receives a death benefit. Any medical expenses paid out for a workers' compensation claim are counted under the medical expenses category.

Replacement

This category involves the costs for replacing damaged or stolen equipment, and for replacement parts for equipment and facilities. For example, one such cost would be to replace an overhead door damaged by a forklift. It can also include the expense for replacing polluting chemicals, such as #2 fuel oil that gushed from a ruptured storage tank.

When a purchase order (PO) is completed for the replaced equipment, parts or chemical, the investigating supervisor lists the PO number on the LISD. Accounting then places the amount charged to this PO in the replacement costs field (4c). For replacement of damaged equipment, accounting would calculate the depreciated cost of the damaged equipment and enter this amount in 4c.

Labor to Repair

This category covers expenses for time spent by maintenance personnel repairing damaged equipment and facilities, or cleaning up polluting material. These costs are collected by the investigating supervisor, who writes the maintenance work order number in the document identification section of the LISD. All costs associated with this work order are then gathered. These include the time workers from various crafts spend repairing the damage plus all parts from the storeroom needed to restore the equipment or to bring the facility back to working order. These costs are recorded in field 4d (labor to repair).

If the damage requires that a contractor be hired, the cost comes from the PO. In such a case, the supervisor records the PO number in the document identification section. Accounting then enters the cost charged to the PO in field 4d.

Product Damage

This cost category involves any damage to either fuel tubes or cooling tubes. Should this occur, the quality control inspector completes either a rework tag or scrap tag. The investigating supervisor places the tag number in either the rework tag field or scrap tag field of the LISD.

If possible, the tube is reworked and reinspected. Accounting calculates the added costs for these steps. The investigating supervisor lists the rework tag number in the document identification section. Accounting records the added costs in the product damage field (4e).

If the tubes are scrapped, the quality control inspector notes on the scrap tags the point in the process at which they were scrapped. When receiving the scrap tags, accounting calculates the loss and records this amount in field 4e.

Fines, Fees, Settlement

These costs include fines issued by federal, state and local governments; any legal fees incurred because of SH&E issues; and any legal settlements whether outside of court or mandated. These amounts are entered into the fines/fees/settlement field (4f).

Costs with an Estimation Factor

The last three cost categories include an element of estimation. Just as Westinghouse's managers accepted these figures as direct costs, LoMIS presents them to students as such (Chekanski 65). These costs involve the use of costing rates, which are explained later. These final three categories are productive work lost, overtime and production downtime.

Productive Work Lost

Productive work lost is time lost of an idle employee due to a loss incident. Examples include 1) employees who are injured and leave their machines to seek medical attention; 2) employees

Abstract: *This article describes how students in a university setting used a computer program specifically designed to analyze loss incident cause and cost data in order to recommend management actions based on cost-benefit analyses. Using the system, students are able to make management decisions within a laboratory setting, experiences that should prepare them to be more effective SH&E professionals.*

Table 2

Cost Analysis of Departments & Injuries from Chemical Exposure

Injury/Illness	Production	Strategic Services
Burns (chemical)	$0	$4,430 (2)
Dermatitis	$18,110 (2)	$0
Dust disease of the lungs	$302,400 (1)	$0
Poisoning (systemic-chronic exposure to toxics)	$394,313 (2)	$0
Respiratory condition (one-time exposure)	$16,300 (3)	$3,455 (1)

Numbers within parentheses indicate the number of cases of the injury/illness responsible for those costs.

Table 3

Cost Analysis of Injuries

Injury/Illness	Outside Contractor Employee	Visitor	Member of Public at Large	Trespasser
Burns (chemical)	$0	$286,000 (1)	$0	$0
Laceration	$36,980 (1)	$0	$0	$0
Sprains	$300 (1)	$0	$0	$0
Strain (back)	$0	$900 (2)	$0	$0
Strain (not back)	$400 (1)	$0	$0	$0
Totals	**$37,680**	**$286,900**	**$0**	**$0**

Numbers within parentheses indicate the number of cases of the injury/illness responsible for those costs.

who evacuate the building when a fire occurs; and 3) employees who are idled when their machine is damaged. The investigating supervisor identifies the operator who was idled and estimates the amount of idle time. The estimated time is entered in hours or fractions of hours under "hours" in the productive work lost costs fields (4g). The program then calculates the total productive work lost cost.

PRODUCTIVE WORK LOST COSTS (4g)		HOURS
Cooling tubes	Draw Bench Operator	2
Cooling tubes	Draw Bench Operator Helper	2
Cooling tubes	Pilger Machine Operator	2
Cooling tubes	Pilger Machine Operator Helper	2
Cooling tubes	Tube Furnace Operator	2
Cooling tubes	Tube Furance Helper	2
TOTAL PRODUCTIVE WORK LOST COST		**$1,190**

Overtime Costs

Instead of being based on an employee's overtime pay, this category reflects the costs of an extra employee(s) needed as a result of the loss incident. This means taking one or more employees from other jobs and reassigning them to jobs necessitated by the loss incident.

For example, an annealing furnace operator injures his leg and must keep it elevated. He can be seated with his leg elevated to operate the furnace controls, but he cannot load and unload tubes onto the conveyor that moves them through the furnace. A general production helper is assigned to load and remove the tubes onto and from the conveyor.

This extra employee creates the overtime cost because she could have been working at another production assignment. Her time creates the cost for the overtime category. Her time cost is calculated at her regular rate, not at time-and-one-half or double time since she is not working overtime (i.e., more than 40 hours a week). Her cost is really an "extra-employee" cost necessitated by the loss incident.

For another example, suppose a conveyor is damaged and does not work. Production must continue, so while maintenance employees repair the conveyor, four general production helpers move the material on pushcarts. Repairs take 3 hours. These 3 hours of "overtime" or "extra-employee" work, times 4 employees, yields 12 overtime or "extra-assigned" employee hours. Again, these employees are not paid overtime wages. The costs of these employees are counted as overtime or extra work costs because they were pulled from other jobs to compensate for the results of the loss incident. In this case, the investigating supervisor would select cooling tubes and general production helper (from the drop-down menu) and place "12" in the hours column. The program automatically calculates this overtime cost of $960.

OVERTIME COSTS (4h)		HOURS
Cooling tubes	General Production Helper	12
Select if necessary		
Select if necessary		
TOTAL OVERTIME COST		**$960**

Production Downtime

The last cost category is production downtime. It can also be called machine or equipment downtime, and it is the cost of a piece of equipment that is not operating because of a loss incident. For example, a pilger is a machine that reduces the diameter and wall thickness of a tube while increasing its length by hammering the tube with dies. Suppose a pilger operator, who is the highest-grade production employee, is injured and told to take off the rest of the shift. The next shift operator is called in early, but the pilger does not operate for two hours until he arrives. The two hours that the machine was idle is production downtime.

Another example might be a forklift running into a pilger machine and damaging it seriously enough that it cannot be operated. The time it takes to repair the machine is considered production downtime. In the example shown below, the investigating supervisor estimated that a drawbench, a pilger machine and an annealing furnace were nonproductive for two hours each. She indicates this by selecting the names of these pieces of equipment from the drop-down menu and entering "2" for the 2 hours each was idled. LoMIS calculates the cost.

PRODUCTION DOWNTIME COSTS (4i)		HOURS
Cooling Tubes Dept.	Draw Bench	2
Cooling Tubes Dept.	Pilger Machine	2
Cooling Tubes Dept.	Annealing Furnace	2
Select if necessary		
TOTAL PRODUCTION DOWNTIME COST		**$6,700**

Costing Rates

The last element that must be determined to calculate productive work lost costs, overtime costs and production downtime costs is how much money per hour is being lost. It is at this point that the concept of costing rates comes in. Novak uses something similar that he calls process costing (112) and Bragg calls it activity-based costing (174-175). The costs provided for productive work lost, overtime and production downtime are based on costing rates. Westinghouse used two types of costing rates: employee costing rates and machine costing rates.

Employee Costing Rate

An employee costing rate is the amount of money it costs an employer to have an employee work for one hour (Wiersema). An employee costing rate includes:

•Direct Costs: Wages, benefits (e.g., medical coverage, life insurance premiums, retirement plans, paid vacations and holidays, sick leave), employer-matching company stock investment plan, Social Security tax, workers' compensation insurance, educational reimbursement and unemployment insurance.

•Overhead Costs: Lighting, heating, water, waste treatment, PPE, work space (office, desk, workbench), tools, computers, supplies, training, recordkeeping, absenteeism, and employee turnover requiring hiring and training.

•Amenity Costs: Parking space (lighting, snow removal, surfacing), cafeteria, medical facilities, locker room, showers, coffee breaks, company picnics, uniforms, lounges, gyms and similar items.

Many costs go into calculating an employee costing rate. Each employee has a costing rate and this amount is often considerably higher than his/her wage rate, a factor that is sometimes 5:1, which means an employee earning $20 per hour could have a costing rate of $100 per hour.

Machine Costing Rate

A machine costing rate is the amount of money it costs the employer to operate a piece of equipment for 1 hour. It includes:

•Direct Costs: Cost of machine, interest on loan to buy, energy to run, and maintenance and repair of the machine.

•Indirect Costs: Inventory of spare parts, training of personnel to run and repair the machine, cost of a building to protect the machine from the weather, profit, wages of support personnel, pollution control and depreciation (Cerepak 705; Coleman 569; Corbin 185).

The costing rate can be substantial. For example, a pilger machine can have costing rates of about $1,100 an hour. If that machine is idle for 1 hour, $1,100 is lost for production downtime.

Causal Data

LoMIS contains data about injuries, occupational illnesses, product damage, equipment and facility damage, environmental pollution, near losses and hazardous conditions that "occur" at Tubing World. The injuries include those that occur to visitors, contractor employees, trespassers, members of the public and Tubing World employees. Product damage is included since the product manufactured is expensive. Reworking or scrapping any tubes because of damage is counted as a cost. The program also has data on theft of company property. Additional data are added every semester, as each student develops a loss incident scenario and adds the necessary facts to the database.

Table 4

Cost Analysis of Departments & Repetitive Motion Injuries

Injury/Illness	Production	Strategic Services
Disorders due to repeated trauma	$28,707 (2)	$24,757 (1)

Numbers within parentheses indicate the number of cases of the injury/illness responsible for those costs.

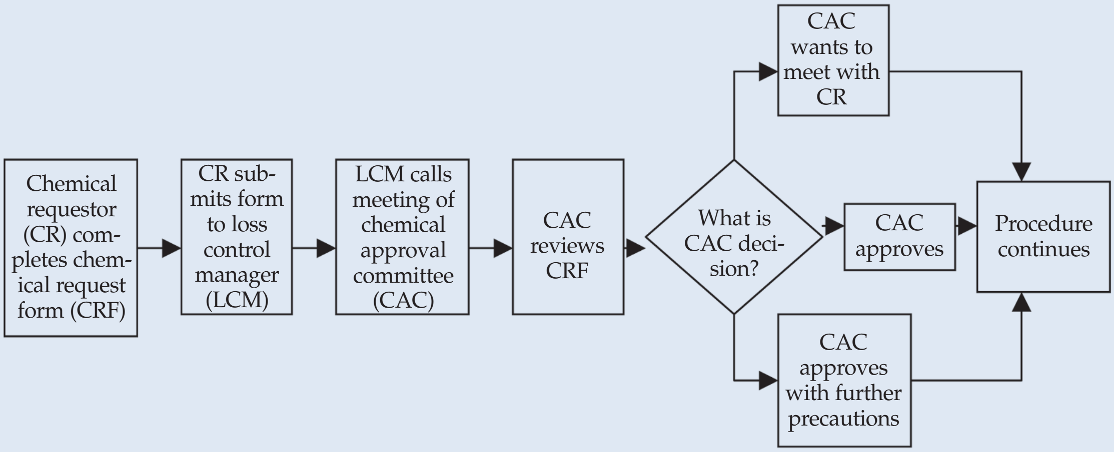
Table 5

Cost Analysis of Departments & Injuries from Chemical Use

Injuries	Production	Strategic Services
Burns (chemical)	$0	$4,430 (2)
Burns (thermal)	$231,719 (2)	$47,188 (1)
Dermatitis	$18,110 (2)	$0
Dust disease of the lungs	$302,400 (1)	$0
Poisoning (systemic-chronic exposure to toxics)	$394,313 (2)	$0
Respiratory condition (one-time exposure)	$16,300 (3)	$3,455 (1)

Numbers within parentheses indicate the number of cases of the injury/illness responsible for those costs.

Figure 1
New Chemical Approval Procedure



New Chemical Approval Procedure Example

Title: Chemical Approval Procedure
Purpose: To provide safeguards for all chemicals used on site
Scope: This procedure begins when a person wants to introduce a new chemical into Tubing World or wants to use a current chemical in a new application.
Policy: In 2005, 14 incidents of improper use of chemicals resulted in losses of more than $1 million. This procedure is designed to reduce these losses.
Definitions: CAC: Chemical Approval Committee
CR: Chemical Requestor (the person who wants the chemical to be brought on site or used in a new application).

Position Responsible	*Action*
CR	1) Completes Chemical Request form found in Appendix A
	2) Submits form to Loss Control Manager
Loss Control Manager	3) Calls CAC meeting
CAC Members	4) Reviews information on Chemical Request form 4a) If approves . . . (procedure continues) 4b) If wants to meet with CR . . . (procedure continues) 4c) If approves with additional safeguards . . . (procedure continues)

Management System Deficiencies

When students create their scenarios, they trace the causes back to management system deficiencies (Petersen 27-28). A management system deficiency is a departmental responsibility that was not met which allowed the student's loss incident to occur (Pope 252-253). Following are 11 examples that can result in a loss incident:

1) Process engineering failed to specify a guard on a new piece of equipment.

2) Maintenance did not act on a work order in a timely fashion.

3) General manager did not hire critical personnel.

4) On its own, purchasing substituted a less-expensive, inferior part that failed to function.

5) Quality control did not inspect a crane hook annually.

6) Scheduling set the production rate higher than production employees can safely meet.

7) Sales and marketing promised customers unreasonable delivery dates.

8) The legal department did not seek restitution from the contractors that did not meet contract specifications.

9) Facilities engineering did not provide a means to lockout equipment.

10) Human resources did not alert supervisors of employees' physical limitations.

11) Accounting did not have contingency funding available to correct problems.

LoMIS allows the students, when developing their scenarios, to have one or more causes that lead back to one or more of these departments. LoMIS is similar to Pope's Safety Management Information System (SMIS), developed while he worked for the U.S. Department of Interior (Pope 257-258). Pope's SMIS and LoMIS charge the causes back to specific departments or subsystems.

LoMIS is effective in both laboratory and real-world situations because department or subsystem managers can remove the causes. The data most used by students for their laboratory exercises are loss incident causes—the deficiencies in each subsystem. Eliminating the costs of loss incidents makes student recommendations beneficial.

Laboratory Exercises

Let's now consider five specific management decisions students make using this program.

1) Students use the program's data to justify the need for specific training courses, which they design and present.

2) They use cost information to set objectives for the loss prevention policy statement for the upcoming year.

3) They assess programming needs to develop a procedure needed to stop specific losses at Tubing World.

4) They conduct a cost-benefit analysis to recommend changes to subsystem managers for how to manage his/her department.

5) They develop a loss incident sequence from which to place data into LoMIS.

Cost-Benefit Analysis for Training

The first lab exercise calls for students to determine training needed at Tubing World. During this lab, the students work in groups of three to analyze the data to identify the company's needs, such as lockout/tagout training. Table 1 (pg. 43) shows five cases (LISD #20, 120, 105, 104 and 51) of employees injured because of lockout issues. Students know this training is required by OSHA. They are also expected to show management the cost effectiveness of providing this training.

Based on the data analyzed, a training course outline is developed. In the case of lockout training, students have about $24,000 with which to work. They are expected to develop at least an 8-hour course for training electricians, millwrights, pipefitters and other maintenance personnel in lockout practices. From this course outline, they develop two units, one of which is selected to develop a unit outline. From that unit, a lesson outline is developed. Students expand this lesson outline into a lesson plan geared toward adult learners that they present to the rest of their lab participants. This process takes four lab sessions.

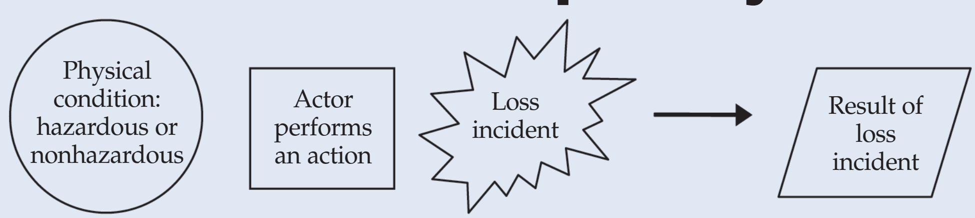
Table 6

Process Engineering Guarding Problem Analysis

Process Engineering Improvement Areas	Costs	LISD
Guard needed to be removed for routine maintenance	$1,250	92
Interlocks needed	$6,182	20
Interlocks needed	$1,540	107
Interlocks needed	$670	120
Interlocks needed	$68	125
Point-of-operation hazard guard inadequate	$6,085	45
Point-of-operation hazard guard nonexistent	$25,450	37
Point-of-operation hazard guard nonexistent	$11,573	74
Point-of-operation hazard guard nonexistent	$3,643	79
Power transmission guard inadequate	$6,182	20
Power transmission guard inadequate	$12,555	32
Power transmission guard inadequate	$730	53
Splash/chip guard inadequate	$550	105

Figure 2

Loss Incident Causal Sequence Symbols



Objectives for Loss Prevention Policy

In another lab, students develop objectives based on reducing loss incident costs for the upcoming year. Using LoMIS, they can analyze the costs by injury and illness type. Table 2 (pg. 44) shows that the costs from eight incidents of employee toxic chemical exposures are $731,123 in the production department. Strategic services, where maintenance is housed, had three cases costing $7,885.

Students can set objectives for both departments and for Tubing World. These objectives become part of the loss prevention policy document they produce. Working in pairs, students analyze the incidents in order to write objectives designed to significantly reduce the losses in the toxic materials control program in the upcoming year. The numbers within the parentheses next to the cost figures indicate the number of cases of the particular injury/illness responsible for those costs. The students can go to the incident reports to analyze the incident causes and the cost factors associated with the injury/illness. The students know that the costs of many injuries/illnesses must be estimated initially and updated as actual costs are incurred and collected.

As Table 3 (pg. 44) shows, the students find that three contractor employees were injured in the current year for a total cost of $37,680. During the same period, three visitors were injured, costing Tubing World $286,900. These figures are used to determine the objectives for the contractor injury prevention program and the visitor injury prevention program, respectively. The objectives for the customer injury prevention program and the trespasser injury prevention program are to maintain zero losses.

From Table 4 (pg. 45), students gather costs for disorders due to repeated trauma in order to set objectives for the ergonomics program. They gather costs for all other injuries, illnesses, equipment and facilities damage, product damage, theft, loss due to natural disasters, and environmental pollution to set objectives for these programs as well.

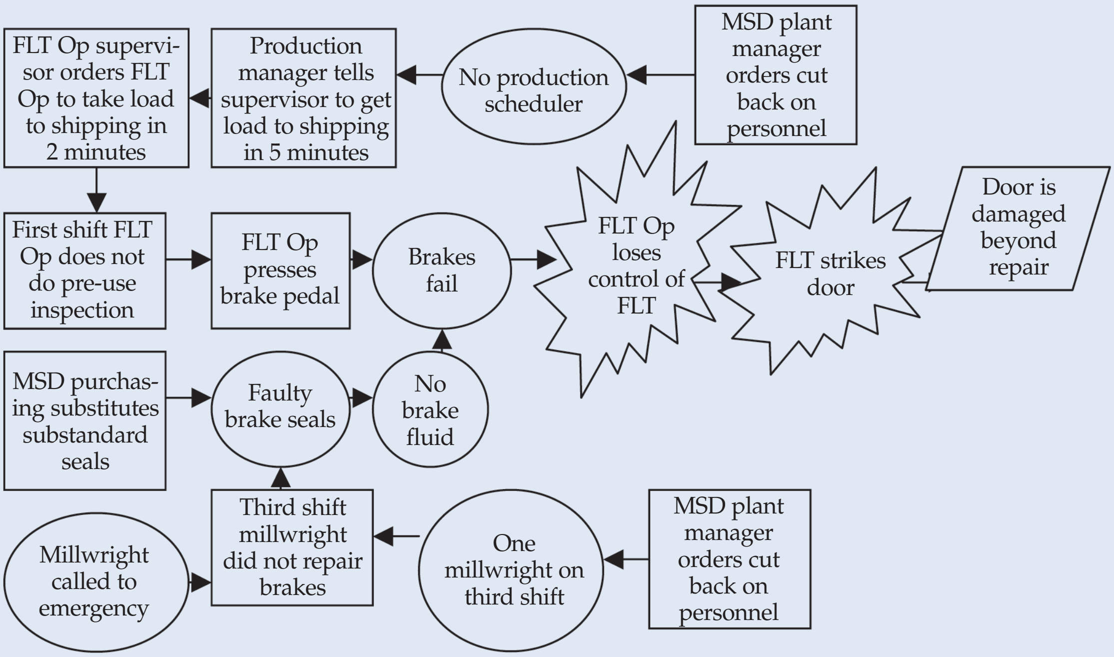
Programming Needs Assessment Lab

Students gather data about the kinds of procedures Tubing World needs. For example, a pair of students decide to determine the costs of loss incidents resulting from chemical use. They find the data shown in Table 5. From these data, they show the need for a new chemical approval procedure. Then, as a precursor to writing the procedure, they must design a flowchart of actions that Tubing World will follow to approve new chemicals. In addition to justifying the procedure using the data in Table 5, students use flowcharting symbols to show how their procedure works (Figure 1, which is partially complete because it serves only as an example).

In the subsequent lab, the students convert the

Figure 3

Loss Incident Causal Sequence



flowchart into a procedure using steps taken in chronological order to approve new chemicals. The procedure must contain the use of a form that they develop as well. The pair of students in this case designed a form that is completed by the requestor in the first step of the procedure. The sidebar on page 46 is the written procedure converted from the flowchart (only partially written to serve as an example).

Changing How a Department Manager Manages

Another lab exercise involves students working in pairs to collect data about causes that were traced back to a particular department and the costs of the loss incidents produced by these causes. The students are focused on removing management system deficiencies, not hazardous conditions.

Cost of Loss Incident

Students may find that inadequate guarding (process engineering) was a causal factor in 13 loss incidents. Table 6 shows the data the students can analyze. Students add these loss incident costs, which total about $76,000. They also read the description of each loss incident caused by inadequate guarding design.

Cost of Cause Removal

Suppose the students decide that the best way to remove this deficiency is to have process engineering institute a procedure for their engineers to follow which will prevent inadequately guarded machines. The students then develop this procedure.

Next, suppose the students decide that the procedure needs a process engineer to be assigned as guarding specialist. They recommend training this engineer in machine guarding design. They conduct research online to determine costs for such training.

The students have $76,000 with which to work. They find relevant courses and seminars, then calculate the cost of the training and travel. They factor in the cost of the engineer's lost time based on his costing rate. The students then compare the costs of eliminating the guarding deficiency to that of the loss incidents caused by this deficiency. They now complete the experience of conducting a cost-benefit analysis to make a management change.

Next, they tally the costs of sending an engineer for training and adopting the procedure to adequately guard equipment. They compare these costs to loss incidents costs resulting from inadequate guarding. They use all these data to create a cost-benefit analysis and compile this into a report recommending that the process engineering manager send the guarding specialist engineer to a particular course in a particular city and that his department adopt the new procedure.

Note that this is the cost to remove the system deficiency identified, not to guard the machines (which is required by law and is not a part of the analysis). This course focuses on teaching students how to recommend management system changes, not technical ones.

The students then write a report (as the loss control manager) to the process engineering manager recommending that he adopt the procedure for guarding design. Included in the report is the recommendation that he choose one engineer to be the guarding specialist who will receive specialized training. The report lists all the details, including a cost-benefit analysis.

COST-BENEFIT ANALYSIS

Cost of loss incidents due to inadequate hazard guarding design:	$76,478
Cost to train one process engineer in hazard guarding:	
3-day workshop	$1,200
Airline tickets	$650
Cost of hotel	$375
Cost of meals	$150
Cost of time at costing rate	$4,500
Total cost of training	$6,875
COST OF LOSS INCIDENTS	**$76,478**
TOTAL COST OF TRAINING	**$6,875**
FUTURE SAVINGS ON NEW EQUIPMENT	**$69,603**

Creating a Loss Incident for LoMIS

The final exercise discussed is the creation of a loss incident causal sequence. Each student learns the symbols for analyzing the causal sequence (Figure 2) and is assigned an outcome or result of a loss incident. S/he must create the loss incident, the acts and condi-

Figure 4

Section E: Supervisor's Corrective Action

(16) Supervisor's Action

Action Taken or Promised 1	Estimated Completion Date 1		
	Month	Day	Year
Instructed all forklift operators to conduct a pre-use inspection no matter how rushed we are	May	13	2005

Action Taken or Promised 2	Estimated Completion Date 2		
	Month	Day	Year
Requested production manager to give us more lead time for getting product to the shipping dock	May	13	2005

Action Taken or Promised 3	Estimated Completion Date 3		
	Month	Day	Year
Sent email to Maintenance Manager requesting that he remind all maintenance personnel to tag out and lock out, if possible, all defective production equipment.	May	13	2005

tions that contributed to it, and the management system deficiencies that allowed the acts and conditions to occur. S/he must also explain the costs of the results.

Assigned result examples include: lead poisoning, minor injury to a contractor employee, stolen propane tanks, repetitive motion injury, property damage resulting in less than $1,000 loss, environmental pollution resulting in less than $100 loss, a reported hazard not resulting in a loss incident and various employee injuries.

Figure 3 shows an example of a loss incident causal sequence resulting in property damage created by a student. The action blocks starting with "MSD" indicate the management system deficiencies that caused the loss incident.

This student's loss incident description reveals that her entry into LoMIS was in three parts: the result, how it happened and the causes (management system deficiencies).

> On May 12, 2005, at 8:05 a.m., a fuel tubes finishing forklift operator lost control of his forklift while descending the ramp in the shipping area. The forklift struck against the overhead door damaging it beyond repair. The operator was not injured. The door will need to be replaced. The forklift was idled while new brake seals were installed and while it was checked for damage from the collision with the door. I had to have four general production helpers move the tubes to the dock using flatbed dollies.
>
> I formed an investigation team of the forklift operator, the millwright who services the forklifts and myself. We found that brake fluid had leaked from the forklift because of faulty seals. Purchasing had substituted a cheaper brand that was substandard (management system deficiency #1). The third-shift millwright had planned to replace the seals, but was called to an emergency when pilger #2 stopped running. He neglected to tagout the forklift. He was the only millwright on third shift because of personnel cutbacks (management system deficiency #2).
>
> At 8:00 a.m., I was called by the production manager to move a load of tubes to the dock because a truck was leaving in 30 minues and he wanted to get the order out today. I instructed the forklift operator to move the tubes to the dock as quickly as possible. He did not perform a preuse inspection. We've had many rushed jobs since the production scheduler was let go through downsizing (another symptom indicating management system deficiency #2).

Entry of these loss incident data into LoMIS would proceed as follows. Because the overhead door was damaged beyond repair, the investigating supervisor would have to complete a purchase requisition for a replacement. The student, acting as the investigating supervisor, entered the purchase order number within the document identification section. The supervisor needed maintenance to install the door. She completed a work order request and entered the corresponding number in the appropriate field. She also entered the location of the loss incident, the title of the supervisor, who is chairing the investigation team, the date of incident and the hour in which the incident occurred.

DOCUMENT IDENTIFICATION	
Injured's Social Security number	0
Purchase order number	PO99564
Work order number	WO44312
Rework tag number	0
Scrap tag number	0
Employee report form number	0

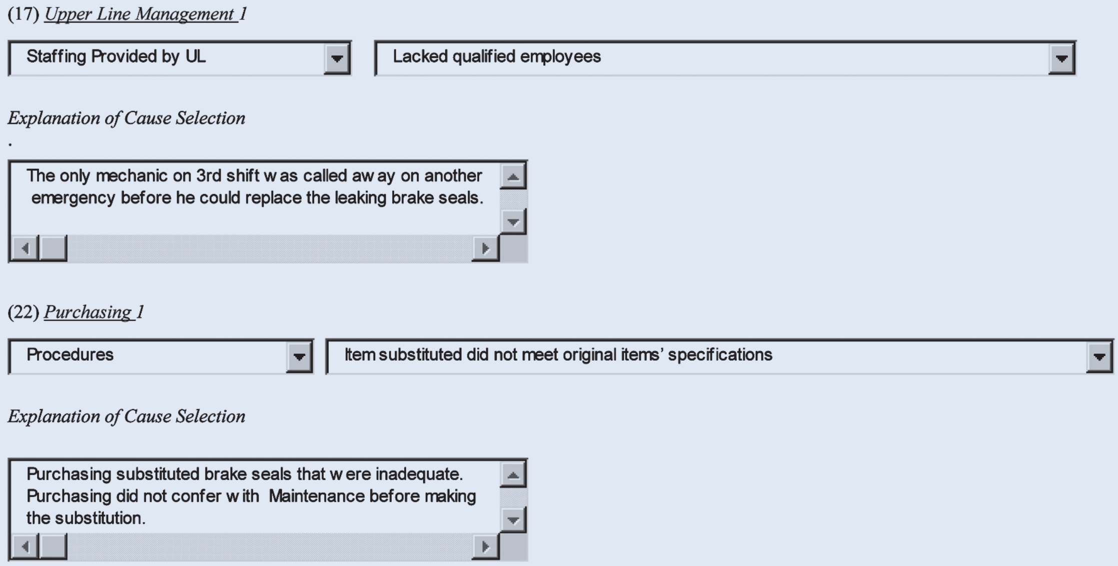
In reality, accounting enters the replacement costs and labor-to-repair costs in the system; however, as a learning experience, the student enter these data as part of the exercise.

The student then entered the productive work lost figures. She estimated 4.5 hours for the forklift operator because he took the forklift to maintenance to have it checked for damage and to have the brake seals replaced. This took 3.5 hours, and she estimated 1 hour for his participation in the incident investigation. Acting as the fuel tubes supervisor, she led a team that included the millwright and the forklift truck driver. She entered 1 hour for these positions under productive work lost costs.

Because the forklift was disabled, four general production helpers used flatbed dollies to move the boxes

Figure 5

Section F: Management Systems Analysis



of tubes to the dock. These extra workers were needed because of the loss incident, so their time was entered in overtime costs. She entered 4.5 hours of downtime for the forklift, 3.5 hours for the inspection and brake seal replacement by the millwright, and 1 hour while the operator serve on the investigating team.

SECTION B: Costs	
4a Medical expenses	$0.00
4b Workers' compensation	$0.00
4c Replacement costs	$800.00
4d Labor to repair	$540.00
4e Product damage	$0.00
4f Fines/fees/settlement	$0.00

SECTION C: Productive Work Lost Costs (4g)		**HOURS**
Fuel Tubes Production	Material Handler	4.5
Fuel Tubes Production	Supervisor	1
Maintenance Dept.	Millwright (First Class)	1
TOTAL PRODUCTIVE WORK LOST COST		**$788**
Section D: Overtime Costs (4h)		**HOURS**
Fuel Tubes Production	Gen. Production Helper	2
TOTAL OVERTIME COST		**$160**
Production Downtime Costs (4i)		**HOURS**
Fuel Tubes Production	Forklift Truck	4.5
TOTAL PRODUCTION DOWNTIME COST		**$3,825**
TOTAL COST		**$6,113**

She then entered data about the damaged property, listing the department whose property was damaged. In this particular case, the shipping department is within the purchasing department. The type of loss incident was "stuck against." The type choices (which are given in a drop-down menu) are defined by ANSI Z16.2 (18-20). Item 6c states the position that could most benefit from a training upgrade, while Item 6d identifies the damaged item.

SECTION C: Type of loss incident		
6a Department		Strategic Services Purchasing
6b Type		Struck Against
6c Dept. & Job Title	Production Material Handler (FLT operator)	Fuel Tubes Production
6d Nature	Facility	Door

Section D contains the incident narrative (given earlier). Section E contains the investigating supervisor's corrective action (Figure 4). In the classroom, the students are taught about the authority limits of the supervisors. Therefore, the actions taken by the supervisor are limited to those within her authority. Upper-level managers' actions arise from Section F.

Section F (Figure 5) contains the investigation team's opinion of the failed management subsystems that caused the loss incident. In this scenario, the investigation team finds one loss incident cause with the general manager (Item 17) and one caused by purchasing (Item 22). As a course project, this student submited a preventive action plan created for the general manager showing how to prevent loss incidents due to shortages of critical personnel. She also submitted a preventive action plan for the purchasing manager showing how to prevent loss incidents due to substituting substandard parts.

As this article has shown, LoMIS gives students the opportunity to make management decisions within a laboratory setting—experiences that are sure to help them be effective SH&E professionals. ■

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