

“It may be difficult to determine the contribution of health and safety measures to the bottom line but it's not impossible”



# SHOW US THE MONEY

One of the main arguments used in the fight to gain more recognition of the importance of good health and safety is the financial one: a safer workplace is a more productive and therefore profitable one. But how sound is this argument? Is there really a relationship between a safe working environment and financial return? Yes, says **Duncan Abbott**, who presents recent ergonomics-related examples in the US as evidence.

**T**o meet productivity and quality demands plant and operations managers strive to lower costs by reducing cycle time, minimising product changeover time, reducing scrap, cutting time spent in rework, and other measures of efficiency. The effectiveness – cost and otherwise – of such measures is usually fairly obvious and straightforward to analyse but the same can't be said of steps taken to improve health and safety. While installing a guard on a dangerous machine will prevent people from being injured by the machine and therefore avoid the various costs of those injuries, thus “improving” the company's finances, the argument is theoretical. An accident may not happen anyway – guard or no guard.

It may be difficult to determine the contribution of health and safety measures to the bottom line, but it's not impossible. Much research has been carried out into the effect on productivity and profit of health and safety improvements, including a recent Swedish study<sup>1</sup> of sickness absence. The study compared sick leave across 340 companies to determine whether or

not the value of prevention measures that increase productivity could be demonstrated. It discovered that feedback on absence and productivity measures was instrumental in stimulating most companies to invest in occupational health and safety in order to gain productivity improvements.

A study of 80 articles<sup>2</sup> that discussed the economics of ergonomics revealed that 68 of the articles evaluated the financial benefits of ergonomic improvements; 53 found ergonomics to be effective in improving the economic position of the firm while reducing injuries and illness; 24 measured productivity; and all reported improved productivity as a result of an ergonomic intervention. The time taken for investments in ergonomics equipment, safety programmes, training, and other elements varied from one month to two years, with 14 cases providing economic benefits within one year.

As further proof that companies can increase productivity and profit through health and safety, following are three short case studies, which emphasise the relationship between a safe working environment and financial return.

### A reach too far

In early 2001, the ergonomics team at **Honda's motorcycle plant in Marysville, Ohio**, with some assistance from external ergonomics consultants, began work on fine-tuning the plant's ergonomics improvement process.<sup>3</sup> Plant workers had identified that the fender finishing operation in the Weld department was a candidate for an ergonomic redesign. The operation involved excessive forward reaching to 28in, awkward upper body postures, and an average of 24 lifts of a 12lb part per cycle. The workstation – originally designed for performing operations on a motorcycle gas tank – required workers to lift and reposition the fender multiple times, resulting in a cycle time of 30 minutes. The fender remained at a fixed height, which made it difficult for some workers to reach all areas of it. Although injuries were minimal among fender finishing, workers' morale was low as the job was avoided owing to its physical demands and difficulty. The job also produced a large amount of costly scrap material.

#### Ergonomic solution

Using ergonomics principles and experiences at the workstation, a height-adjustable new fender positioner, which requires only two lifts to load and unload the part, was installed. It is simple to operate and allows workers to easily manoeuvre and lock the part, without lifting into

an infinite number of positions. The design reduced forward reach to 15in, and eliminated awkward postures. No injuries have occurred at the new fender positioner, and workers who once avoided the operation are now happy to use it. (In recognition of its work in this area the Honda ergonomics team was awarded the prestigious 'Ergo Cup' for 2002).

#### Cost benefit results

The redesigned fender positioner demonstrates the bottom-line value of good ergonomics: scrap material was reduced by 83 per cent, and Honda attributes savings of US\$500,000 a year to injury avoidance, and to improvements in quality and productivity. The most significant impact on cost has been the 50 per cent reduction in cycle time from 30 minutes to 15 minutes.



### A job well handled



In late 1999, Lucent Technologies, responding to an increased volume of mobile phone sales, planned to increase production at its Columbus, Ohio facility, of an amplifier used at its mobile telephone base stations.<sup>4</sup> Recognising the importance of ergonomic design in terms of both productivity and employee health and safety, engineers and h&s staff took this opportunity to make significant ergonomic improvements to the assembly process. The ULAM (ultralinear amplifier) weighed 35lbs and had an original bench-top assembly process of 40 minutes per unit. The process flow consisted of five different sub-assembly stations and a transfer cart. With increasing volumes, there were concerns about production yields, as well as ergonomic challenges due to manual material handling.

#### Ergonomic solution

Occupational ergonomics specialists were enlisted to define project goals and manage the implementation process. Several concept drawings and applied ergonomic design guidelines to 'design out' heavy lifting, manual manipulation, etc. were developed, existing vendor solutions were searched, and customised modifications were ordered. The final design included articulating arms for line loading and a custom conveyor that integrated the workstation components. After the initial receipt and review of the equipment, it was clear that further modifications were necessary. Additional vertical supports were added to workstations and air-lift ball transfers and rollers were added to work surfaces to minimise transfer forces. Performance testing was then done at a fabrication shop. After several production runs operators, engineers, and h&s specialists were able to identify additional improvements.

#### Cost benefit results

The new assembly line reduced product build time by 44 per cent (from 40 minutes per unit to 22.4 minutes per unit) and improved first test yields by 61 per cent. It is estimated that the new line will save the company approximately US\$1.2 million dollars a year. Meanwhile, a survey among the workers after implementation showed a positive response to changes.

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### Driving safety forward

The third case study concerned the car industry<sup>6</sup> and focused on bolt torquing and exhausts system handling departments. Direct costs of ergonomic injuries on the chassis line were calculated as being US\$1,458,000 in 1996, as a result of 54 incidents. Half the workforce had reported shoulder pain and a risk assessment revealed that workers on the chassis line had to undertake an excessive number of lifts and extended reaches during the operation.

#### Ergonomic solution

On the chassis assembly line each job underwent an ergonomic assessment. Task elements (manual torque test and exhaust system installation) were identified as those responsible for the majority of injury potential.

#### Cost benefit results

The challenge to redesign bolt torquing and exhaust system handling resulted in implementation of powered torque tools and an exhaust system mechanical handling assist, at a system cost of US\$98,000. The gain in 1997 resulted in injury costs reduced to US\$945,000, while in 1998 costs were further reduced to US\$486,000, with an overall total cost saving of US\$1,431,000. Moreover, injury costs had been reduced in two years to less than half of the 1996 amount. Within six months of the implementation of ergonomic changes complaints of shoulder discomfort fell to 10 per cent.



### Methods to determine cost benefits<sup>9</sup>

To justify the cost of ergonomic changes in the work environment, engineering economic models can be used to financially assess the value and illustrate the benefits of an ergonomic intervention. Three common techniques are:

- 1 Benefit/Cost Ratio (BCR)
- 2 Payback Period (PB)
- 3 Losses vs. Goods Sold (LGS)

The BCR method allows a comparison to be made of the cost of ergonomic-related injuries and the cost of implementing an ergonomic solution. BCR makes the assumption that implementing the ergonomic solution will eliminate future ergonomic-related injuries. Generally, any time the ratio is 1.0 or greater, the solution should be implemented – for example, if the cost is £2500 for an improved worksurface and the benefit from the worker's increased output is also calculated at £2500 then it is recommended to make the change.

Using the PB technique the length of time it will take to recover the costs of improvements can be calculated. Again, the costs and benefits associated with the ergonomic solution will have to be determined in order to calculate the time it will take to offset the cost of implementing the solution.

The company must determine for itself what an acceptable payback period for an investment is.

The LGS technique involves calculating the sales volume required to offset the cost of an injury, thus providing a monetary figure that a company should be willing to spend to implement an ergonomics solution. To use this method, the profit margin for the business must be known.

The metrics involved in tracking results can vary significantly but ultimately it is the outcome measures that count. These are productivity measures (e.g. cycle time, cost per unit), quality measures (e.g. scrap rate, rework), injury measures (e.g. incidence rate, absenteeism), and customer acceptance of the product (e.g. number of units sold).

Two areas that must be looked at when examining cost benefits of ergonomic interventions are time (where the costs and benefits are measured will depend upon the point in time, the amount of time, or the total time in which the interventions are evaluated) and the accounting of costs and benefits – who pays for what costs.

### Conclusion

Most studies of economic issues in ergonomics have used case studies,

such as those presented above, which found ergonomic interventions to be cost-beneficial in improving safety, productivity, or both. While the costs of interventions can be minimal, benefits of ergonomic interventions can be considerable.

Employers need to count the cost of poor working conditions and be made aware that injuries, stress and tiredness can be the result of a poorly designed workplace. For a cost benefit analysis to demonstrate the value of ergonomic interventions it must show the employer that the profit generated from safe workplaces exceeds that of an unsafe workplace. An important point to remember is that the biggest cost to a company is the loss of an employee's work effort – not necessarily the medical cost but the impact of the employee not being there!

The ability to understand economic arguments and calculations in a similar way to accountants and financial directors will help the safety practitioner demonstrate the effectiveness of measures taken to improve health and safety.<sup>7</sup> In many cases, this can be as simple as demonstrating the estimated cost against the estimated benefit. **SHP**

### References

- 1 International Association of Ergonomics Proceedings 1997
- 2 Grob, H and Dong, X: *Ergonomics and the economic payoff in the construction industry*, Ergoweb proceedings and Transcripts from managing ergonomics in the 1990s
- 3 Human Performance Ergonomics™ case study (*Honda of America cuts cycle time and scrap by improving ergonomics with Humantech*)
- 4 Human Performance Ergonomics™ case study (*Lucent Technologies Achieves Breakthrough Production Savings with Humantech*)
- 5 Anonymous case study of a US auto company
- 6 Alexander, DC (1998): *Strategies for cost-justifying ergonomic improvements*, IIE Solutions, March 1998, pp30-35
- 7 A useful publication to help with this understanding is: Oxenburgh, M (2003): *Increasing Productivity and Profit through Health and Safety*, ISBN 0415243319, Taylor & Francis

### About the author

Duncan Abbott has extensive experience in providing ergonomic consultancy and training for a wide range of clients (banks, manufacturers, retail, and government agencies). Contact da@enricosmog.com