

THERE IS MORE TO "HEALTH AND SAFETY IS GOOD BUSINESS" THAN AVOIDING UNPLANNED COSTS?

A STUDY INTO THE LINK BETWEEN SAFETY AND BUSINESS PERFORMANCE

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Abstract

A statistical study of the construction performance records of Foster Wheeler Energy UK Ltd, shows a strong association ($R\text{-square} = 0.63$) between improving safety and improving productivity. This is corroborated by another study of construction performance at a single petrochemical site in Europe. The study indicates that halving safety risk is associated with a 12% improvement in productivity. [For a site of 600 workers this gives an annual labour cost saving in the order of £2.4million]. In a separate case study on a meat processing industry, the cost benefit of safety management was calculated using a total loss control approach. Over a ten year period the internal rate of return was 7%. However increasing productivity was also associated with the improved safety performance. When this was taken into account the internal rate of return was in excess of 30%. The size of these financial benefits gives an incentive for further statistical study and gaining understanding of why the relationship between productivity and safety exists.

Key Words: Business, Control, Cost, Loss, Performance, Safety, Schedule, Total.

Introduction

In an age when organisations are required to work with limited and fewer resources, health and safety professionals are not exempt from the discipline of demonstrating effectiveness in meeting business objectives. There is a need to show that the cost and effort expended on safety has yielded a return. Traditional methods of doing this have involved showing performance by trending injury frequency rates. In recent years this has been refined by the approach of total loss control, in which the costs of all unplanned events are calculated and trended. This method is essentially aimed at reducing the negative events - costs to the organisation, and pain and suffering to individuals.

The phrase "Health and safety is good business" inside the front cover of HSG96 (1997) is followed by case studies showing the magnitude of costs from unplanned events. HSG96 logically and justifiably leads to the conclusion that reducing the number of unplanned events will cut losses. However there is more to good business than reduction of losses. There is also the generation of income. In this the ethos of total quality management with its focus on customer delight and principles of continuous improvement and participation at all levels has wide acceptance.

Parallels have been drawn between total quality management and safety management, Krause (1994), Cooper & Phillips (1995). These suggest that safety management can be improved by using total quality management processes. But is the relationship only one way? Is there any evidence of benefit in the opposite direction? Maybe business can be improved by safety management processes? Is there, perhaps, any evidence to suggest that there is a positive contribution by safety to the improvement of business performance?

In this study links between safety and business performance were assessed statistically. This covered not only cost performance but also schedule and productivity. The study showed a strong link between improving safety and improving productivity. It may be that traditional methods of assessing the cost benefit of safety do not give the whole story. The financial impact of a possible contribution of safety to productivity was assessed. In a subsequent case study on a cattle farm and meat processing company, financial returns from a loss reduction approach were compared with the returns which included a productivity credit from safety.

Background to the Foster Wheeler Study

A discussion on the concept that "health and safety is good business" triggered the study. Within Foster Wheeler was the widely expressed opinion that the project key performance indicators of cost, schedule, safety and productivity were all interdependent. If one deteriorated, it would have an adverse effect on the others - conversely, if one improved it would help improve the others. However this was based on gut feel not on a systematic study of the evidence.

It was decided to assess whether existing performance records would support this opinion. If all possible pairings of indicators showed a positive association between improving performance in one indicator and improving performance in the other, the opinion could be held to be true.

Methodology

Performance data from archive records of projects directly managed by Foster Wheeler were tabulated and weighted by man hour content. The data was from 19 projects ranging from 0.5 to 34 million field man hours and averaging 3.4 million man-hours.

From this data four indicators were derived...

1. **COST RATIO** - $(\text{Total project control budget cost})/(\text{Actual project cost})$
In this an indicator of cost performance was the ratio of the project budget to actual cost. Values greater than 1.0 were better than budget; values less than 1.0 worse than budget.
2. **SCHEDULE RATIO** - $(\text{Planned construction span in months})/(\text{Actual construction span in months})$
In this the ratio of planned project span (time from 5% completion to 95% completion) to actual span was used as an indicator of schedule performance. For values greater than 1.0 the performance was better than planned, and less than 1.0 performance was worse than planned.
3. **SAFETY** - $(\text{Actual or estimated exposure man-hours in millions})/(\text{No of lost time injuries})$
This is the average number of man-hours worked per injury normally referred to as the "duration rate". An increasing value denotes improving performance. Data is plotted on a logarithmic scale because of the wide range of injury frequency rates. Injury frequency rate values of 0 and infinity are therefore unworkable. A figure equivalent to the company's best ever run between injuries (22 million man hours) was used where there were no lost time injuries.
4. **PRODUCTIVITY RATIO** - $(\text{Budget field man-hours})/(\text{Actual field man-hours})$.
Budget field man-hours are generated using information on the project scope, location and execution strategy as well as in house proprietary estimating methods. The ratio of budget man-hours to actual hours was used as an indicator of productivity. For values greater than 1.0 the productivity was better than estimated, and less than 1.0 productivity was worse than estimated.

Of the four indicators (cost, schedule, safety and productivity) there are six possible pairings. Regression analysis was applied to all six pairings and the results tabulated by direction of association and strength of association.

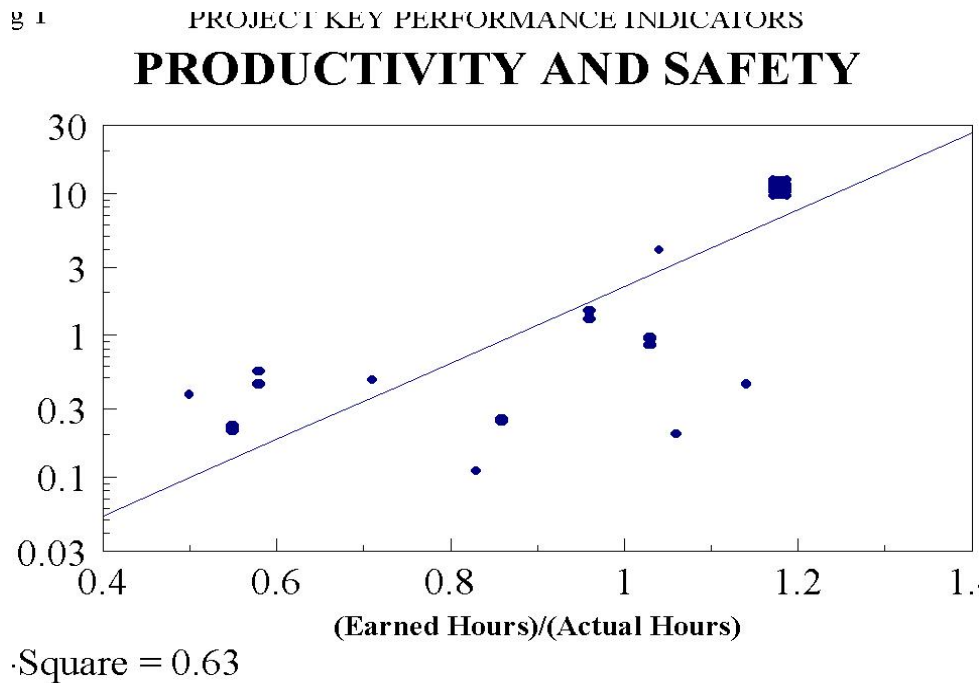
Results

All six possible pairings of indicators demonstrated a positive association between improving performance in one indicator and improving performance in the other indicator. The strength of these associations, R-Square, is shown below.

<u>PAIRING</u>	<u>ASSOCIATION</u>	<u>R-SQUARE</u>
Productivity/Schedule	Positive	0.83
Productivity/Safety	Positive	0.63
Productivity/Cost	Positive	0.49
Schedule/Safety	Positive	0.43
Schedule/Cost	Positive	0.40
Cost/Safety	Positive	0.20

Thus the evidence supports the opinion held by Foster Wheeler.

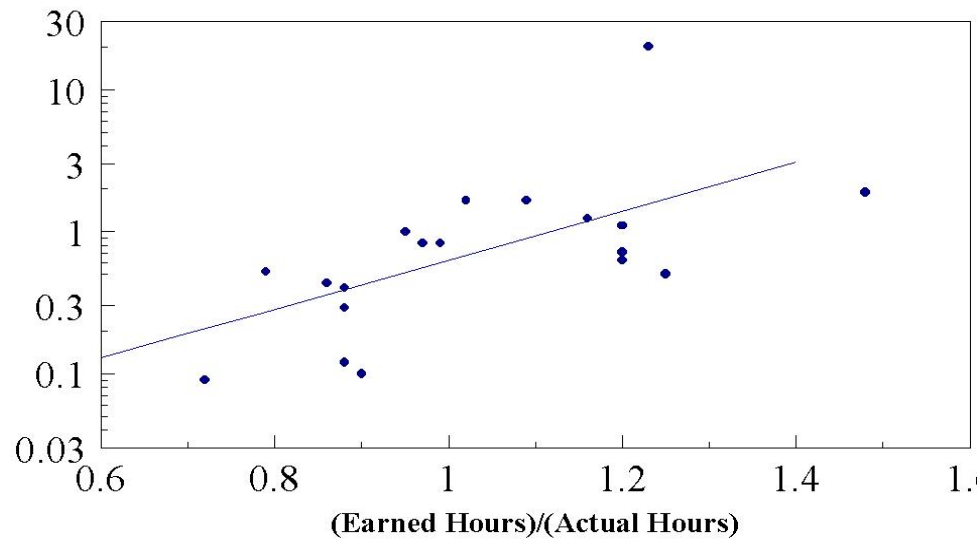
Of interest is the association between productivity and safety. This shows that halving injury frequency is associated with a 10% increase in productivity (Fig 1)



A Separate Study Shows a Similar Association

A Separate study was carried out using the construction records at a single petrochemical site within the European Union. This again showed a positive association between improving safety and improving productivity. This time halving injury frequency rates was associated with a 15% improvement in productivity. (Fig 2)

PRODUCTIVITY AND SAFETY



$r^2 = 0.42$

The Association Between Productivity and Safety,

Which is the Dependent Variable or Are They Interdependent?

The Foster Wheeler study indicates that there is a positive association between the improving performances in all the four performance indicators. The study at a single petrochemical site showed a positive association between improving safety and improving productivity. However, the studies did not indicate the direction of association. It is notable that the strongest associations all involved productivity. It is possible to deduce that cost and schedule are dependent on productivity. For a given quantity of work, the higher the productivity, the lower the number of man-hours expended and the lower are the labour costs. For a fixed number of men, the higher the productivity is, the greater is the work output and the better is the schedule.

But what of the association between productivity and safety? Does safety depend on productivity, does productivity depend on safety, or are they both dependent on something else? Available literature and interviews with construction managers and health and safety professionals suggest that they are interdependent, and actions taken to improve one will improve the other.

Collins (1996) reports in case studies that gainsharing strategies improve business performance. Laitinen, Saari, and Kuusala (1997) report in a case study that behaviour modification based on ergonomics makes it possible to improve both safety and productivity. Krause and Finley (1993) assert that attitudes, techniques and methods used in total quality management are equally applicable to the management of safety. Mattila, Hyttinen and Rantannan (1994) conclude that the characteristics of effective safety supervision are the same as for generally effective supervision.

Similar conclusions arose from site interviews. Interviews with 23 construction managers and health and safety professionals followed the identification of a positive association between safety and productivity. They were invited to comment on the findings of the study and to suggest reasons for the association. Twenty-two of the 23 expressed no surprise that there was a positive association.

Reasons given were....

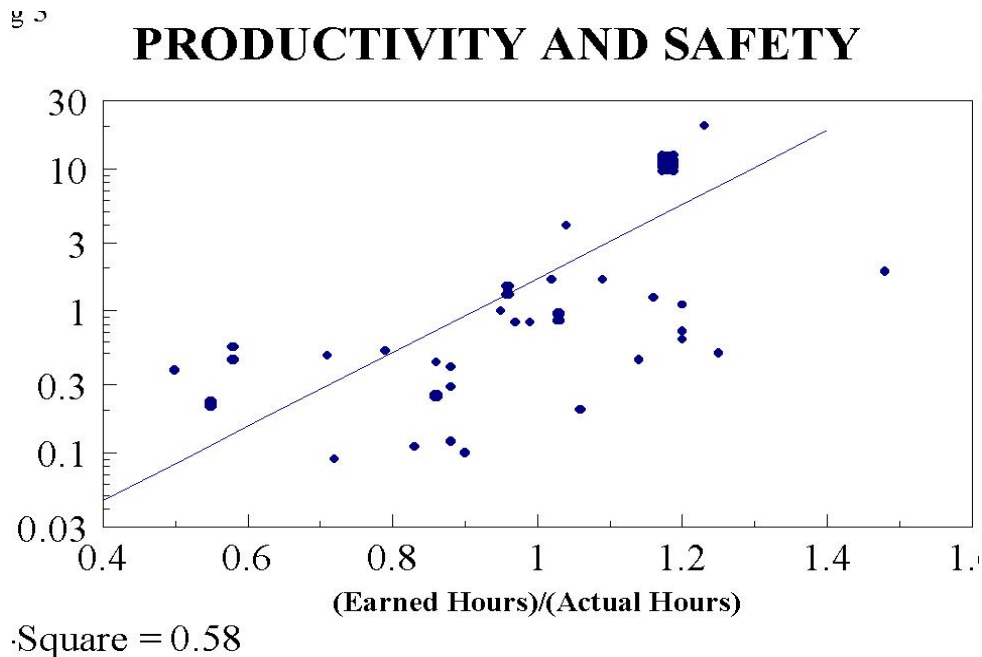
Common Actions - 13 interviewees cited common actions that resulted in both good productivity and good safety as a reason. Examples given include both management actions (planning, training,

communication, measurement and control), and physical action (housekeeping, site layout, traffic flow and adequate access).

Risk Assessment - 10 interviewees gave the discipline provided by risk assessment as a reason. The process of working out what could go wrong, its impact and measures to reduce risk of occurrence, was equally as applicable to productivity as it was to safety.

The Cost Benefit Implications of the Association between Safety and Productivity

Figure 3 shows the scatter chart for productivity and safety when the data from the two construction studies are combined. From this the productivity increase associated with a halving of injury frequency rates is in the order of 12%.



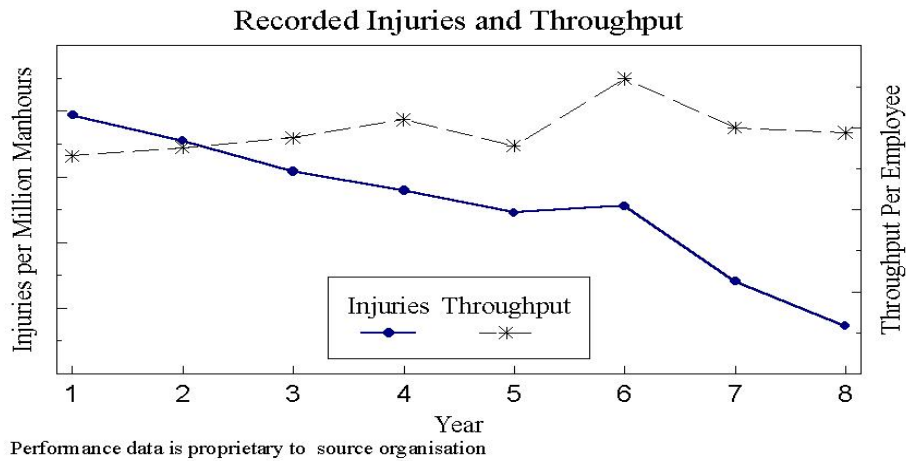
For a construction site of (say) 600 workers, with an average labour cost including overheads of £20/hour, the annual labour cost saving associated with halving injury frequency rates is £2.4 million.

Case Study - The Cost Benefit from Safety and Productivity Compared With the Benefit from Safety and Reduced Accidents

How does the cost benefit of safety from this study compare with traditional loss control methods of calculating safety credits?

Foster Wheeler no longer uses the trending and costing of unplanned events (total loss control) as a key performance indicator. Instead they use a rolling cycle of progress and man-hour checks together with safety inspections and safety management audits. Poor safety performance or poor inspection/audit results automatically trigger a review of all project management areas - cost, schedule and quality as well as safety.

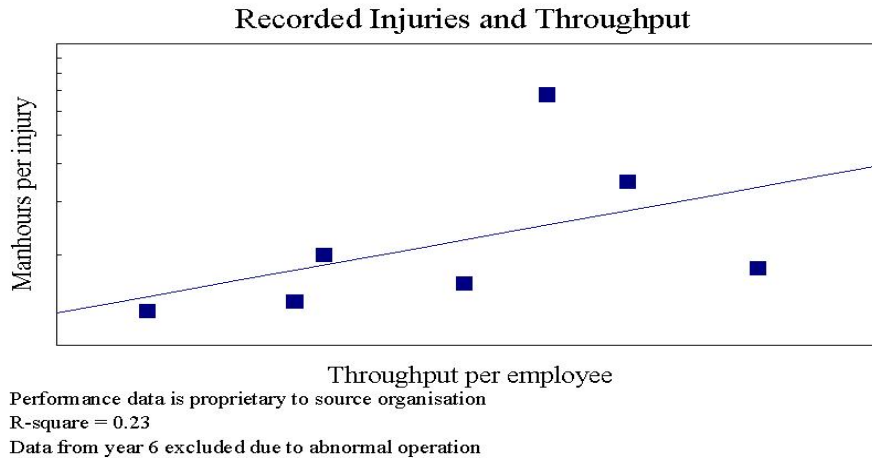
A comparison with the traditional loss control method of calculating the cost benefit of safety used data from a client company of one of the authors. This is a meat producing company that farms and processes cattle. In the late eighties it instituted a restructuring of its management systems including safety; since that time there has been a steady improvement in both safety and productivity (Fig 4).



The company provided information on the reducing costs of accidents and, as a result of improving external audits, a reduction in its insurance premiums.

According to traditional cost benefit approach of reducing unplanned costs, the internal rate of return for the cost of implementing and maintaining the safety management system was 7%. However this took no credit for improving productivity.

Figure 5 shows the association between the safety performance and productivity. During the study period, productivity improved by 11%.



The on-site health and safety professional indicated that improvements made for safety reasons such as better ergonomics and housekeeping, had also increased productivity. Risk assessment techniques, learned for safety management, were also proving useful to the business operation. As an indication of the potential cost benefit, a conservative 1% improvement in productivity was attributed to safety. This increased the internal rate of return from 7% to 30%.

Conclusion

Foster Wheeler expend in the order of 30 million man-hours per year at varying construction sites across the world, the single petrochemical site average 5 million construction man-hours a year, and the meat processing company expend 1 million man-hours per year. This study shows that, for these companies with their different

sizes and type of operation, there is a positive link between improving safety performance and improving productivity. It does not, however, confirm the direction of association.

A literature review and feedback from Foster Wheeler managers and on-site health and safety professionals, suggest that safety and productivity are complementary - action taken to improve one may also improve the other. The size of the potential cost benefit from reducing safety risk justifies more research. What actions taken for safety reasons increase productivity, and what actions taken for productivity reasons improve safety?

REFERENCES

Collins D - *How and Why Participatory Management Improves a Company's Social Performance. Four Gainsharing Case Studies* - Business and Society 1996,35, 2, June, 176-210

Cooper M D, Phillips R A - *Killing Two Birds With One Stone: Achieving Quality Via Total Safety Management* - Leadership and Organizational Development Journal, Vol 16, No 8 95

HSE - The Costs Of Accidents At Work - HSG96

Krause T R - *Safety and Quality: Two Sides of The Same Coin* - Quality Progress Oct 94

Krause T R, Finley R M - *Safety and Continuous Improvement - Two Sides of the Same Coin* - Safety and Health Practitioner, Sep 93, Vol 11/9, p19

Laitinen, Saari, and Kuusala - *Initiating an Innovative Change Process for Improved Working Conditions and Ergonomics With Participation and Feedback: A Case Study in an Engineering Workshop* - International Journal of Industrial Ergonomics, 1997, Vol 19, No 4, 299-305

Mattila, Hyttinen and Rantannen - *Effective Supervisory Behaviour and Safety at the Building Site* - International Journal of Ergonomics, 1994, Vol 13, No 2, 85-93