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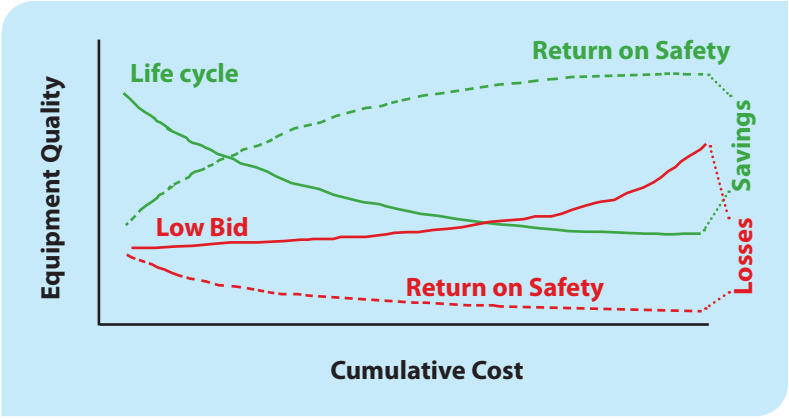
THE ECONOMICS OF WORKPLACE SAFETY

Conveyor safety is not a modern trend derived from government regulation; it's a common-sense idea as old as the first conveyor design. In the modern age, safety is a key factor in worker protection, reduced insurance rates and a lower total cost of operation. There are several hurdles to the installation of safety equipment, the biggest of which is the near-universal use of the low bid process.



Below - Figure 1: Life cycle cost comparison.

When companies buy equipment based on price (low bid) the benefits are short-lived and costs typically increase over time. In contrast, when purchases are made based on lowest long term cost (life-cycle cost), benefits usually continue to accrue and costs go down, resulting in a net saving over time (See Figure 1). Safer and more reliable equipment is easier to service, has a longer life and is less expensive to maintain.

Organisations that embrace safety show significant performance advantages over the competition. The proof is reflected in reduced injuries and greater productivity, along with above industry average

financial returns and higher share prices. Justifying safety investments is greatly enhanced by quantifying what most financial managers refer to as 'intangible costs,' i.e.: injuries, lost labour, insurance costs, the effects of low morale, legal settlements and so on. However, managers and accountants have been trained to think about saving direct costs to justify investments.

When conveyors don't operate efficiently they have unplanned stoppages, release large quantities of fugitive materials and require more maintenance. Emergency breakdowns, cleaning of excessive spillage and reactive maintenance all contribute to an unsafe workplace.

Safety pays

Numerous case studies revealing the positive relationships between safety and productivity are backed up by organisations that gather global statistics on accidents and incidents. The simple formula for return on investment (dividing savings by cost) does not capture the potential savings from safety investments. Several organisations provide detailed and regional statistics on the cost of accidents (See Table 1).

Lacking specific historical data, managers can turn to numerous reliable sources that provide the probability of incidents that can be used to estimate tangible and intangible future costs (See Table 2).

The financial technique used to compare options is called a 'net present value' (NPV) analysis. NPV compares different investment options with varying costs and savings (cash flows) over time, discounting them by the company's cost of money.

For example, an internal risk analysis shows that a facility has 30 workers exposed to conveyor hazards. The estimated probability of the different classes of accidents (fatal, lost time and first

Country / Region	Fatal Accident	Lost-Time Accident	First Aid Accident
Established Market Economies	US$2,750,000	US$150,000	US$2750
Former Socialist Countries	US$500,000	US$28,000	US$500
India	US$60,000	US$3000	US$60
China	US$100,000	US$6000	US$100
Other Asian & Islands	US$1,000,000	US$56,000	US$1000
Sub-Saharan Africa	US$210,000	US$12,000	US$200
Latin America & Caribbean	US$600,000	US$33,000	US$600
Middle East Crescent	US$1,140,000	US$64,000	US$1100
World Average Rate	**US$795,000**	**US$44,000**	**US$789**

Above - Table 1: Regional Statistics on costs of accidents. Based on averaged sources from the US, Canadian and Australian HSE Organisations and International Labour Organization estimates.

Below - Table 2: Accident rates per 100,000 industrial workers per year. From *Introductory Report: Decent Work - Safe Work*, International Labour Office, Geneva, World Congress on Safety and Health at Work, Orlando, 2006.
*First Aid incidents are estimated to be three times more prevalent than Lost-Time Incidents.

Country / Region	Fatal Incidents	Lost Time Incidents (p/hr)	First Aid Incidents*	Fatal Diseases
Established Market Economies	3.8	2900	8700	67.0
Former Socialist Countries	9.5	7250	21,750	80.9
India	9.0	6900	20,700	59.0
China	12.2	9300	27,900	52.2
Other Asian & Islands	18.5	14,100	42,300	43.0
Sub-Saharan Africa	19.1	14,500	43,500	75.5
Latin America & Caribbean	18.0	13,700	41,400	49.4
Middle East Crescent	13.3	10,150	30,450	89.3
World Average Rate	**12.7**	**9725**	**29,175**	**63.0**

Type of Incident	No. Workers Exposed	Cost of Accident	Probability of Accident	Projected Annual Cost
Fatal	30	US$2,750,000	3.8/100,000	US$3135
Lost-time	30	US$150,000	2900/100,000	US$130,500
First Aid	30	US$2750	8700/100,000	US$7178
TOTAL ESTIMATED COST OF ACCIDENTS				**US$140,813**

Above - Table 3: Estimated total annual cost for all accidents for the case of an established market economy.

Below - Table 4: Annual accident costs for years 1 to 20 for the case of an established market economy.

Type of System	NPV of Projected Accident Costs	Discount Rate	Additional Investment	Accident costs (Years 1 - 20)
Low bid System	US$2,816,260	5%	US$0	US$140,813
Alternate Bid System	US$877,427	5%	US$750,000	US$70,407

aid) is multiplied by the cost of these accidents to reveal what could be invested to reduce the incident rate by half (See Table 3).

Assuming the life of the conveyor is 20 years and the cost of money (discount rate) is 5%, the available additional investment would be about US$750,000 more in design time to accomplish the 50% improvement in safety. By choosing the lowest-priced bid to meet the minimum safety requirements, the short-term expenditure ends up costing considerably more over the 20-year lifecycle (See Table 4).

By spending US$750,000 more to exceed the minimum safety and design requirements and reduce the accident rates by 50%, the annual projected cost of accidents drops from US$140,813 to US$70,407.

Measured in today's money - including the additional investment of US$750,000 - the projected savings over the 20-year term at 5% are about US$1.2m by investing more upfront. If, after further analysis, the savings are found to be less, perhaps only a 25% reduction in the cost of accidents, the upfront investment is still justified over the long term. Even though it takes a little more effort to collect data and do a financial analysis, in the end, NPV consistently proves that safety does indeed pay.

Above Left: Inefficient conveyor operation leads to unplanned downtime, fugitive materials and increased maintenance. ©2022 Martin Engineering.

Left: A well-designed conveyor system controls the maximum load at the highest achievable volume, with the safest possible work environment. ©2022 Martin Engineering.