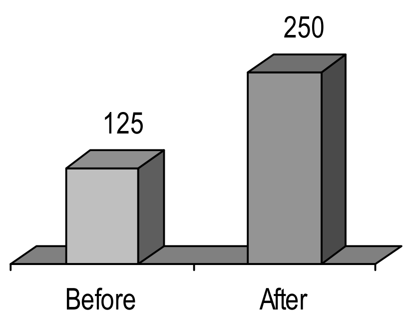
Case Examples

Ergonomics, Productivity, and Safety



Plant-wide output doubled as a result of ergonomics improvements.
See example, page 4.

Dan MacLeod
February 11, 2009

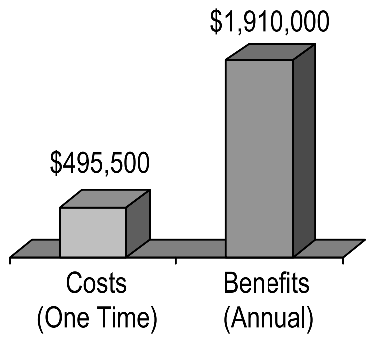
These case examples are some of the more interesting ones from Dan's personal experience. More details on these examples are available in his book *The Ergonomics Kit for General Industry* and on his website www.danmacleod.com.

Plant-wide cost-benefits — Die cast plant

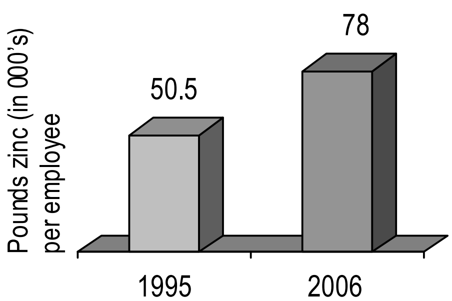
This case example is based on the financial benefits over a 10-year period at a small die cast operation in central Ohio. At the time of the visit to this facility, it had incorporated more ergonomics improvements per capita than most other companies in the U.S. In fact, it was difficult to spot any employees in the classical bad working positions like bending down to get parts or reaching overhead.

Undoubtedly, these effects have occurred throughout many companies with good ergonomics programs, but the advantage here is that this facility is small, i.e., only about 100 employees. As is often true, causes and effects are more visible in small facilities and plant-wide successes easier to document.

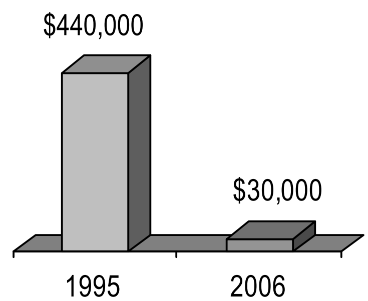
Summary costs and benefits
(10 year period)



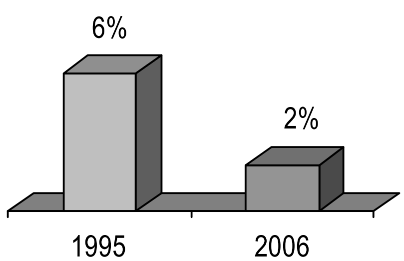
Breakdown of benefits



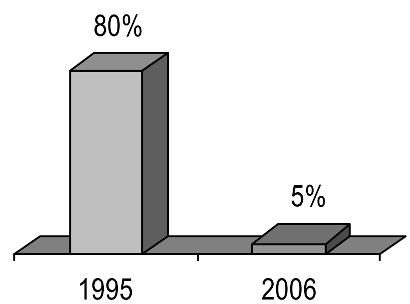
Productivity
Up 54%



Workers' Compensation Costs
Down 93%



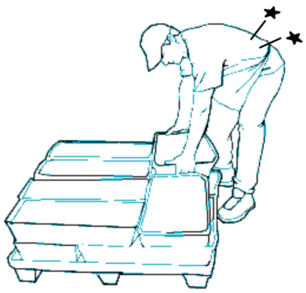
Absenteeism
Down 67%



Turnover
Down 94%

Time savings from a pallet lift — Distribution center

This example from a distribution center shows how a standard pallet lift reduced cycle time by 14 – 20%, plus reduced the load on the spine by 66%.

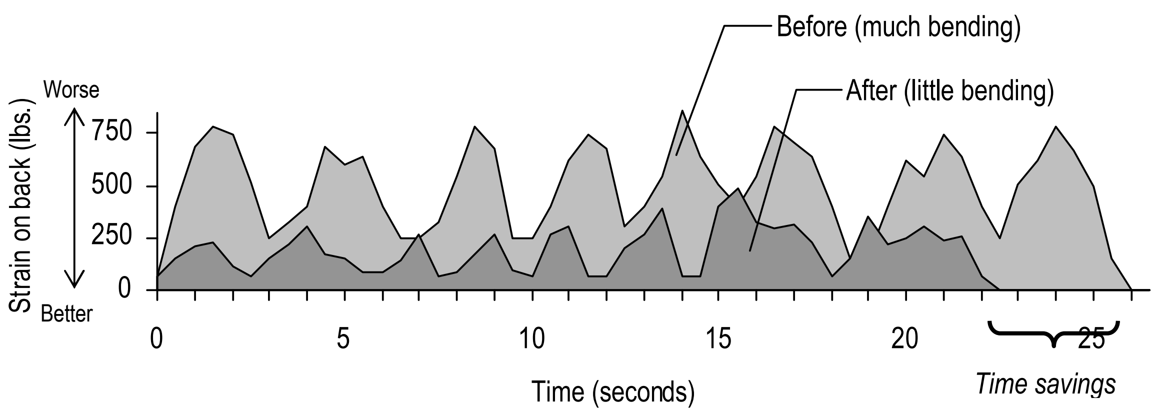


Before

After

The graph below compares lifting a series of eight boxes onto the conveyor, first with the pallet on the floor and then with the pallet lift. The sequence and orientation of the boxes were exactly the same. The only difference was the height. The results are superimposed to help highlight the differences.

The horizontal axis of the graph is time and the vertical axis is strain on the back (specifically, compression force on the discs in pounds.) Each peak represents one lift. The lower the peak and the less area in the peak, the less strain on the back. The less horizontal distance at the base of each peak, the less time needed to make the lift.



Quantitative evaluation shows that the average load on the spine for these eight lifts without the pallet lift was 494.7 lbs. and with the pallet lift 166.1 lbs. Thus, the load on the spine was 66.1% less.

The time needed to complete these eight lifts was reduced from 25.5 seconds to 22.0 seconds, thus a savings of 13.7%. Additionally, a time study was performed on a full pallet-load of trays, which yielded a slightly larger time savings: 6.5 minutes without the lift and about 5.2 minutes with the lift, thus a savings of about 20%.

Time savings from a pallet lift –
Machine load/unload and product packing

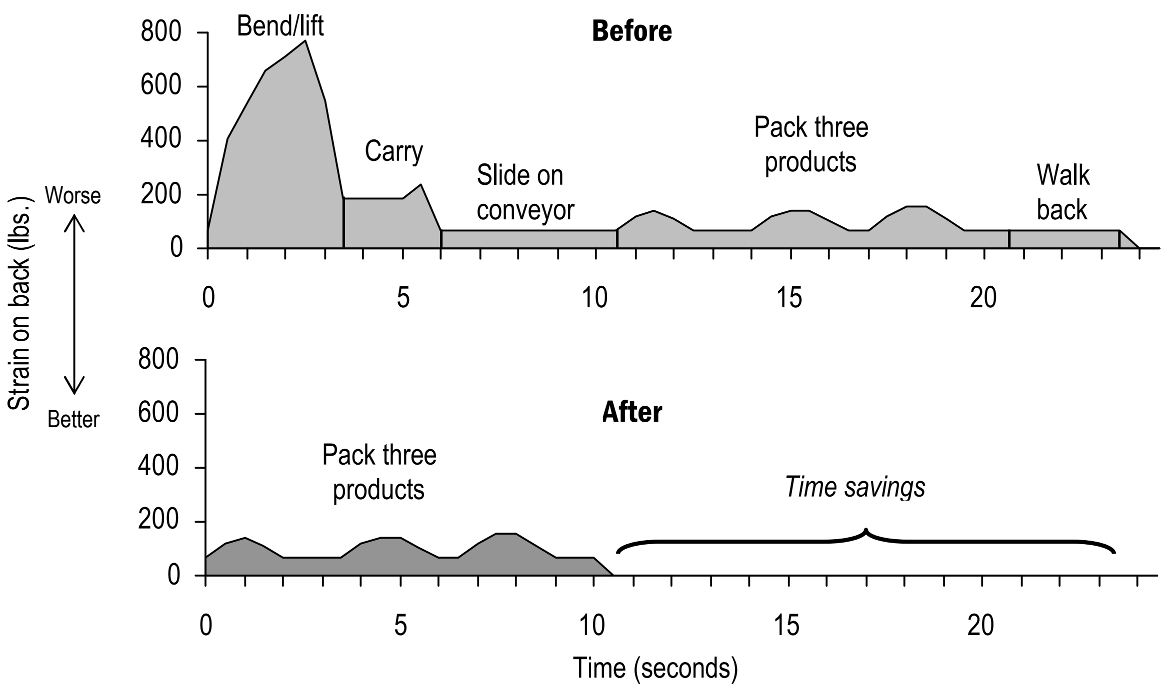
Overall production rates in this plant increased from 125 per hour to 250 per hour as a result of using pallet lifts to raise materials off the floor. The following evaluation shows details on a single packing job where the work cycle dropped 57%, from 23.5 seconds to 10.0 seconds to pack three products. The strain on the back simultaneously dropped 44%.

Before: Bend, lift, and carry

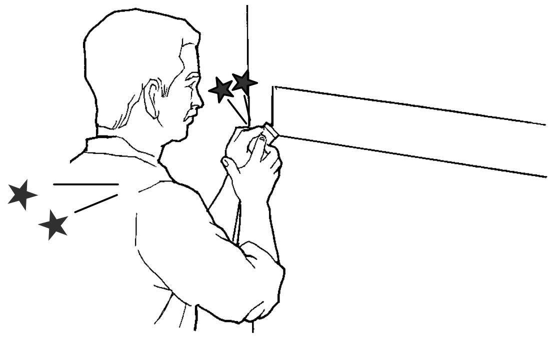
After: Conveyors and pallet lifts bring the product immediately adjacent to the packing line.

Previously, employees needed to walk to pallets for materials, bend (when the stack was low), and carry back to the packing line. The steps of the job are clearly evident in the graph below. Using pallet lifts and conveyors to bring the product adjacent to the packing line reduced the wasted time and the strain on the back, again as is clearly shown in the graph.

Note that there is almost nothing in this example that is different from concepts of Methods Engineering that were developed in the 1920s. However, it was the ergonomics evaluation that led to identifying the issues and the ideas for improvement.

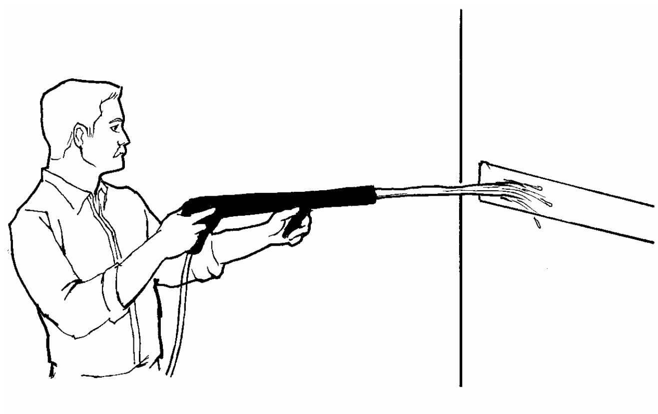


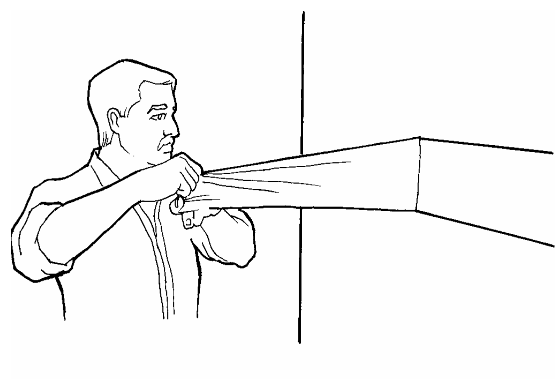
800% productivity increase – FREE!



In a large vehicle repair shop, about once a year the mechanics need to prepare used delivery trucks for resale. Part of the process had involved scraping off old decals that covered the trucks with a small razor blade tool — essentially one inch at a time using an upward motion of the arm. The work typically took one or two days, and since no one liked doing the job, it was normally assigned to the mechanic with the lowest seniority.

Shortly after the ergonomics process was introduced, an employee who started doing the job contacted the Safety Committee chairman (another mechanic) and the two of them immediately began to brainstorm and test alternatives. After a time, they discovered they could use the existing the power wash to heat the body of the vehicle, after which the decals easily peeled off.

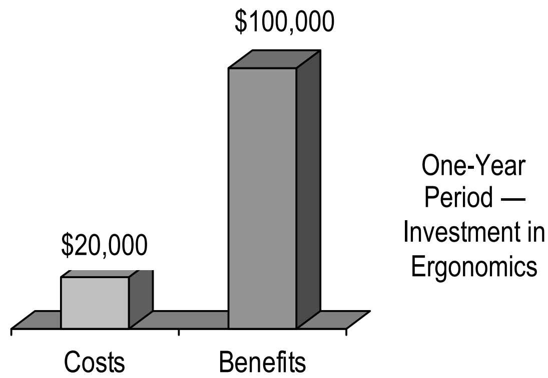




The new method reduced the time from one day per truck to one hour — an 800% increase in productivity— saving roughly three weeks in preparing the vehicles for sale. Moreover, it eliminated what might have been a serious injury to an employee's hand and arm. Plus it was absolutely free, since the power wash was already at hand.

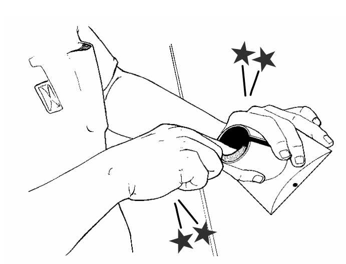
This is the ultimate objective of the workplace ergonomics process. A workplace culture took hold where employees felt empowered to think about their jobs, identify problems, and brainstorm solutions. The employees themselves tackled a long-standing problem that they had taken for granted and identified an improvement that was effective and without cost.

500% ROI in one year



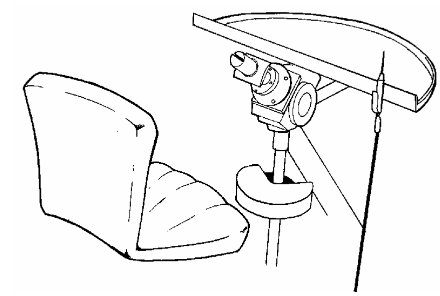
This example involved a small machine shop of 60 employees where the insurance carrier cancelled the plant's workers' compensation policy because of the high number of musculoskeletal disorders. The plant was forced to turn to the state insurance pool with its extremely high premiums.

The ergonomic improvements were all very low cost (and some very innovative – see below) and the plant returned to normal insurance a year later. In some ways, this case example is atypical because the costs were horrendously high. Yet, these situations do exist, and undoubtedly companies fail every year because of the absence of good ergonomics.



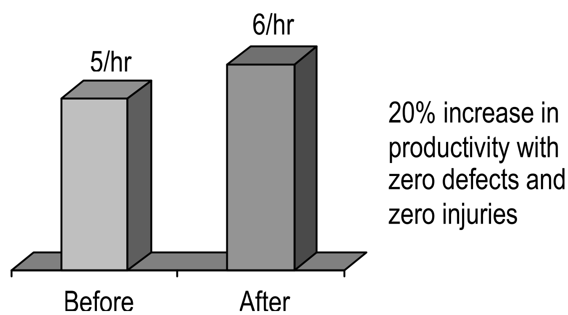
Before: Left-hand manipulation

After: The potter's wheel

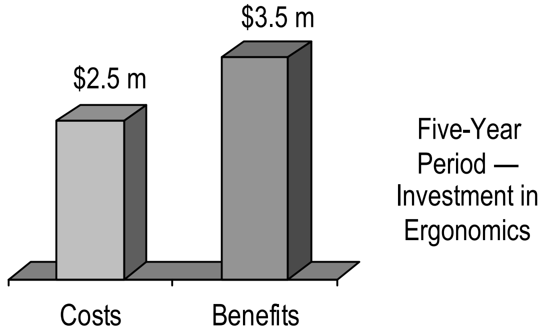


Continuous improvement

Deburring the parts was the source of most injuries, plus the defect rate was unacceptably high because employees had a difficult time doing the work effectively. The worst single job was dramatically improved by using a Potter's Wheel as the basis for a fixture. The creative workstation yielded a 20% increase in productivity, while simultaneously both the injuries and defects dropped to zero. Ultimately, the engineers and machine operators (who previously had been unaware that deburring was causing injuries) found ways to eliminate the burrs mechanically.



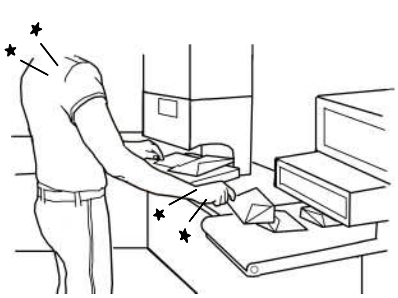
Plant-wide cost-benefits — Paper mill and converting



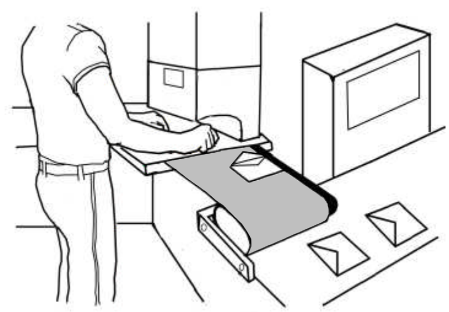
This company of 1200 employees was cited by OSHA for musculoskeletal disorders, paid a $300,000 fine, and was required to establish a formal ergonomics program. Fortunately, the company set up an excellent process that resulted in a $1 million savings over five years.

Many of the individual task improvements have implications for other companies and are described in more detail in *The Ergonomics Kit for General Industry* and at www.danmacleod.com. A few examples are summarized here to provide a sense of the efficiency improvements that resulted.

Mechanical flipper

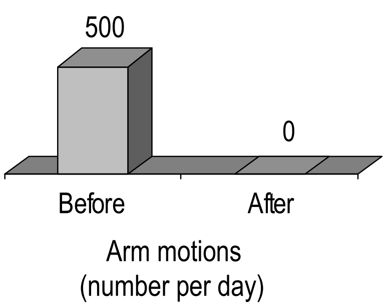


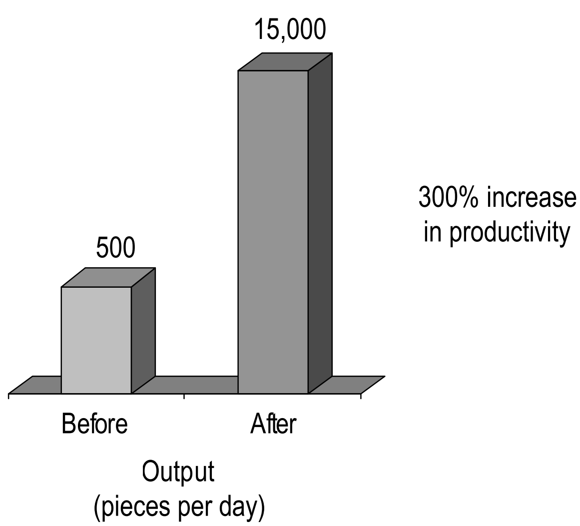
Before: Manual flipping



After: Mechanical flipper

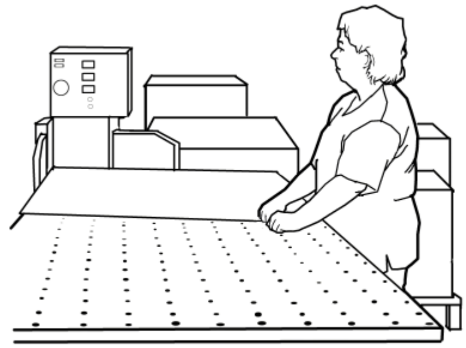
Innovative mechanical flippers were added to engraving presses that eliminated repetitive arm motions and freed the printers to perform other, more important tasks. The idea for the mechanical flipper came by adapting a mechanism on a large automatic press.





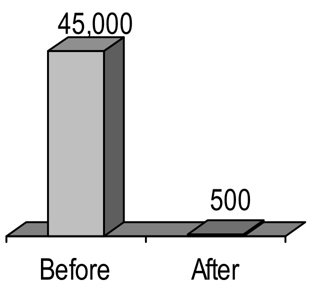
Paper counting

Before: Manually counting stack upon stack of paper

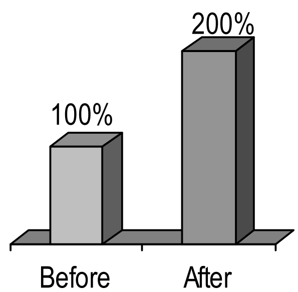


After: Workstation with lifts, paper counter, and air table

The task involved counting stacks of folio-sized paper and inserting a slipsheet every 50th or every 100th sheet. The work involved 45,000 to 50,000 finger motions per day, mostly while working in awkward, static postures. "No one wanted to do this job." In this case, the employee took the initiative to develop a plan to recycle some used equipment, change the layout, and buy a single piece of new equipment. The time required to do the job was cut in half. The results are shown below, involving a payback period of about one year.

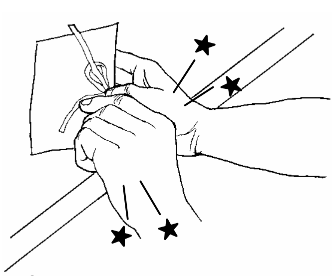


Finger motions (number per day)

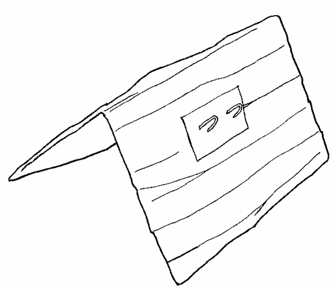


Output (% of original)

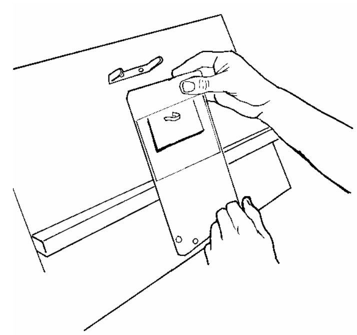
Employee invention: A ribbon-tying device



Before: Tying ribbons by hand



Prototype: Paper clips, a manila folder, and clear tape.



After: A more polished device

The final example from this plant involved an employee who invented a device to improve a manual ribbon tying task. She made a prototype at home on her kitchen table, which engineers used to create a more durable device. Hand problems dropped and productivity increased about 40%.