



INCREASING
PRODUCTIVITY
WITH PROPER
ERGONOMICS

It doesn't matter how you spin it,

ERGONOMICS IMPROVES PRODUCTIVITY

The well-being of employees increases output and with that comes greater profit. For the industrial engineer, efficiency is always top of mind. It's what keeps you up at night, and what sharpens your focus by day. You're always striving to create a better workplace. And tips for improvement are always welcome. Here's a 7-step guide for you to use when shifting your outdated workplace into one that's ergonomic-rich, better suited for your staff – and more efficient. Take advantage of these steps to put ergonomics to work and improve productivity at your company.



What is ergonomics?

If you ask someone what “ergonomic-friendly” means, chances are, you’d get a lot of different answers. Many tend to assume it’s about back posture, or maybe arm reach. The truth is, most people aren’t wrong. But they aren’t necessarily right either. They are only looking at a small part of ergonomics. It’s having everything related to body function, movement, eyesight, noise level and more, all working together, to provide a whole work environment that allows the user to work safely, easily, and without discomfort.

Here’s an easy way to describe it: Ergonomics allow workers to do their jobs. Do it right, do it safely, do it with comfort, and, do it with accuracy. A good ergonomic workspace takes into consideration many types of furniture, devices and tools that can improve the space itself for the employee. This can include adjustable workbenches, chairs, accessories, tool rack solutions, tilting storage bins, adjustable computer screens, arm rests, foot rests, temperature controls, air conditioning, lighting, seating, and more.

Ergonomics is the sum of all parts. By having all components and areas in easy reach and at comfortable distances, it minimizes the amount of bending, twisting and reaching workers need to make, and consequently reduces strain, stress, and discomfort, leading to a more relaxed positions and greater efficiency. The expectation is that throughput should be positively affected when proper ergonomics are applied across processes. Companies should look to apply ergonomics to reduce absenteeism, boost company morale, scale back employee injury, improve quality, and increase output.

“As an industrial engineer, most of my job is to improve efficiency within an operation, primarily concerning labor and cost savings. Using ergonomic principles can greatly alter the amount of labor an associate spends performing tasks. Even if a process...only saves us 1.6 seconds per package, if we process 3 million packages a day, we can save upwards of \$100K in labor costs. We also apply ergonomics to benefit employees directly. Much of our workforce is required to do manual labor, be mobile, or be on their feet for long periods of time. As engineers, we need to understand personal fatigue and delay. Therefore, we can help reduce fatigue factors by implementing resources such as anti-fatigue mats...This not only creates a more enjoyable working environment for the employee but also provides us with an employee that will be more energized and productive.”

*- Parker Asmus,
from a large logistics and supply chain company from Louisville, KY.*

Wondering how you can get into the world of ergonomics and create a more productive workplace? **Here's how:**

1 RESEARCH AND CREATE A PLAN

Being a professional, you know how much more costly a project is if it needs to be redone from scratch. Let's think about this in terms of industrial workstations. For years, you've fallen deeper and deeper into an abyss of workspace designs that are outdated and anti-functional. The furnishings, desks, tables and accessories were purchased in 1985 and random pieces of add-ons and customizations have been added over the years. Either cost, or, lack of knowledge dictated the original purchase decision. And, it now requires a great deal of work, time, effort, and budget to correct and make ergonomic-friendly. Let's assume you inherited current workplace conditions from a predecessor who just didn't have the right frame of mind when it came to ergonomics. Shame on them. But now you need to start anew.

You essentially have two options. Try and make fixes to your current work environment or bite the bullet and conduct an entire makeover. The former may be suitable, depending on your needs. But by thoroughly understanding current issues you have, the state of your current equipment, current processes and people interacting with these, you will reveal if an entire overhaul is worthwhile.

So a good place to begin is to research and create a plan. Upper management will want to know why you are making certain decisions and feel good about them too. Having a detailed plan at ready will help you provide those much-needed answers. Build research and evidence into the report as you advance in your project.

You must research in order to find the best possible fit for your company as a whole and your employees as individual workers. You can avoid short-term spending if you make the right long-term decision now. Take a while to understand what ergonomics is (you've already started by reading this guide!) and what type of furniture and tools are out there to help make up an ergonomic setting. Having knowledge now will make it easier later when you are reviewing products or speaking to vendors.

Many companies are out there redefining their work environments to reap the benefits as increased productivity. Are companies in your industry paying attention to lighting, piece movement method, tool placement, sitting-standing possibilities, or something else? Take a look at their processes, the furniture and equipment purchased (if available), and the result of the changes. Can your business replicate the success? While cost will obviously play a part in your ultimate decision, don't let it be the deciding factor. Try to get a feel for the investment vs the benefits the changes will bring.

If employee reaches parts with arm extended 1 min more every hour, in a workplace with 10 people it adds up to -> 10 persons x 220 days x 8 hours x 1 min => 36 days work per year.

Now, research vendors and narrow down your selection. Interview and question each, documenting customization options, pricing and more. By having all of this information in one place in the plan, it can help in the decision-making process and allow you to be confident in your final direction.



Lastly, you'll want to be able to measure the impact that the new workstations have on your company. Remember, your work doesn't end after you purchase. You'll need to prove the investment worthwhile. Be sure to record all current metrics related to safety, output and efficiency prior to implementation. Incorporate that into the plan. That way, it will be easier to compare and contrast once new workstations are incorporated into your work environment.

2 CONDUCT INTERVIEWS AND OBSERVE

How will you know what to correct if you don't know what has fallen short in the past? The best way to look at ergonomic shortcomings are from injury reports and interviews with workstation users. The past tells a story. From severe injuries to general aches and pains that your staff has experienced over the years, this much-needed insight into what is wrong with the current equipment, can assist you to lay out priority list for your new workspace, and the type of workstations and tools needed. This is an essential piece to your plan and must be done before getting closer to a decision.

It's no secret. Ergonomics decreases workplace injuries. In an ergonomic-friendly setting, workers are operating at comfortable speeds and reaching and bending in such a way where it will less likely result in injury or discomfort.

What causes injury in these ergonomic-weak settings? Some common risk factors created with poor workspaces include:

- Awkward and uncomfortable postures
- Contact pressure
- Forceful exertion
- Unnecessary reaching
- Straining body or eyes
- Exposure to vibrations
- Exposure to poor air (moisture, dust, humidity, mold, ventilation)
- Improper lighting

Observe, does this take place in your work environment? Over time, these could lead to severe injuries or bodily harm, maybe even causing temporary or permanent disability. Beyond not wanting your employees to suffer, consider the costs related to workers' compensation, disability payments and loss of knowledge.

Pay attention to not only the individual workplace but also its surroundings, the whole process. Pay attention to work shifts and job rotation. For how long or how repetitively are tasks performed, to get the big picture.

COMMON HEALTH CONDITIONS THAT AN ERGONOMIC-POOR ENVIRONMENT COULD CAUSE INCLUDE:

Carpal Tunnel Syndrome
Fingers and toes feel numb or cold
Loss of coordination
Muscle tightness, aching or cramping
Shorter range of motion
Slipped Discs
Swelling, inflammation or joint stiffness
Tendinitis
Tennis elbow
Tingling or numbness in hands or fingers

Remember that injuries aren't always exterior. Think beyond the surface too. If poor ergonomics are causing stress, it could affect individuals differently, and lead to some mental impairments. Consider employees who suffer from headaches, breakouts, depression, high blood pressure, poor digestion, or slowed metabolism. Injury reports cannot uncover everything. Talk to employees about both their physical and mental health and how the workplace set-up could be an influencer. Listen and document your findings.

OSHA (Occupational Safety and Health Administration) has been a long-time supporter of ergonomic solutions, suggesting that work tasks should be designed to limit exposure to ergonomic risk factors, and stating that engineered systems make for the most ideal and ergonomic-friendly environments. OSHA says: "Making these changes has reduced physical demands, eliminated unnecessary movements, lowered injury rates and their associated workers' compensation costs and reduced employee turnover. In many cases, work efficiency and productivity have increased as well."

Make time to meet with your human resources department and/or your safety director too. Understand complaints or injuries that have been documented over the past five years. Set up times to review each department and shift and observe how they interact with their workstations, tools and each other. How do they perform their duties? How comfortable do they look? Where might there be ways to improve efficiency? Observe. And measure output. If injury or even just discomfort is at play, you need to know about it.

Understanding how and where your staff is straining will lead to much better decisions when purchasing new furniture, equipment and workstations. This is how you will know what to order, what to customize, and how each station should be set-up. Reduce injury and promote a healthy, happier staff. One that works better and more comfortably, which leads to boosted output and higher production rates.

3

ROUND UP THE TROOPS

Buying all new ergonomic-friendly equipment and furniture for your plant, production center or research laboratory? It's not as hard as it seems. Start by getting buy-in from all players involved.

It may seem counterproductive to take time to win over your team, as the sooner you get new furniture adopted, the sooner productivity and output gets a much-needed boost. But in the long run, having everyone be a believer, will lead to faster decisions and quicker adoption.

Consider holding a company-wide meeting or training that explains ergonomics and the critical role it plays within an organization's workspace. Include examples of ergonomic-focused stations, cite stats, and consider showing images of newly engineered environments. Then, share details from your plan that suggest the changes that will take place at your company and why. Take the knowledge from your research and deliver it. Be the expert. Get your troops educated and on board.

They will be looking for the "WIIFM" (What's In It For Me?) motive - and in this case that's easy to explain. An improved ergonomic environment will benefit employees by allowing them to work in an environment that is less stressful and strenuous, so they should have a vested interest. Be open to discussion and ask for their input on ways that their workstations could be improved. What are they looking for? What's missing currently? They could help you create a better solution and their input could result in quicker adoption rates too.

On the opposite end is upper management - the ones approving the purchase order when you're ready to pull the trigger. It's important they believe in your plan and are eager to have the new workstations affect the company's labor activity. Focus on the long-term impacts. Be transparent about the inefficiencies with the current set-up and the result - injuries or weak productivity statistics. Make sure to explain the goals that you hope to accomplish with ergonomic furnishings and equipment. Give them assurance that this is in the best interest of the company.

By getting team-wide buy-in, you can feel better about everyone's confidence level in this purchase that will affect so many. Plus, everyone's newfound knowledge of ergonomics will ensure the workstations are used to their fullest potential where results can truly be felt. Ergonomics can truly present a win-win situation.

4

REMEMBER THE NOT-SO-OBVIOUS

Like Six Sigma implementation that has proven to improve a process by preventing or eliminating defects, improved ergonomic environments can achieve similar results. Jack Welch, CEO of General Electric for 20 years, understood the importance of an intentional program like Six Sigma implemented into a company. He said: "Six Sigma is a quality program, that when all is said and done, improves your customer's experience, lowers your costs, and builds better leaders." With those same goals in mind, the proper ergonomic work environment is of utmost importance in allowing an employee to mirror that same standard of excellence in everyday tasks.

Many parts all working together create a comfortable, functional, efficient workspace. To determine the correct ergonomic equipment for a workstation, you'll want to evaluate a number of factors. Some questions you'll want to ask to help determine the products you'll need include:

1) DOES THE WORK REQUIRE SITTING OR STANDING OR BOTH?

If tasks require paperwork, typing, no heavy lifting, and/or all tools for the job are provided in arm's reach, then the workstation should be designed for sitting, but with possibility to stand. Latest cognitive research shows how beneficial 'slight moving around', such as working standing every now and then along the day, can be. It's been studied that even slight movements, like standing up every now and then, improve memory, attentiveness, learning and ultimately cognitive performance. So what better way to improve efficiency of a desk-tied person?

If tasks require lifting heavy loads, continuous movement, parts retrieval, and/or there is no leg space, then the workstation should be designed for standing but with possibility to rest every now and then, whenever possible.

When seeking out potential solutions, consider chairs, stools, footrests, and easily adjustable workbenches, which allow for both sitting and standing work - that may be most suitable for your environment and staff.

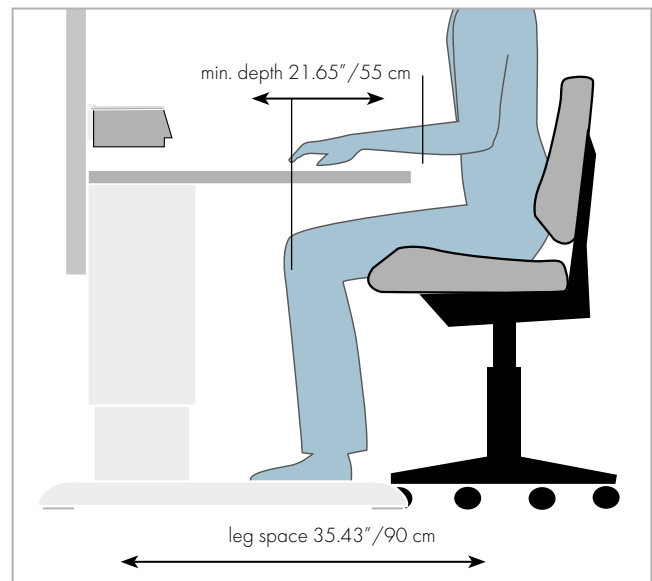
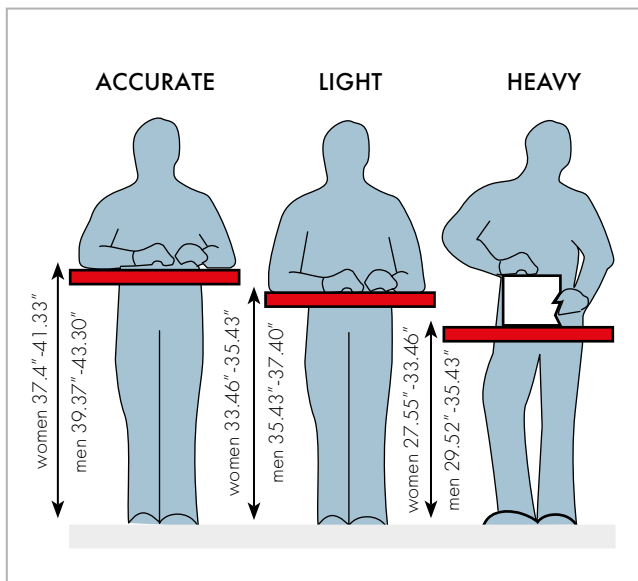




2) DOES THE WORKBENCH SURFACE CATER TO THE PERSON AND THE TASKS THAT ARE BEING EXECUTED?

When sitting, a desk surface should typically be 25 to 30 inches high for writing and typing and can be positioned as much as 10 inches higher if tasks demand an elevated platform. Depending on personal preference, the surface should offer the versatility to be lowered 2 inches to accommodate for body size.

When standing, the desk should be 30 to 45 inches high, and, once again, able to adjust to 2 inches lower if needed. The adjustments here are critical so as to cater to various heights and somatotypes. Ensure it's comfortable to rest arms, reach products, or see a monitor. Most often it's good to avoid overly large or deep workbenches. One option is to favor customized tables.



3) WHAT TYPE OF CHAIR IS BEST?

Fitting, comfortable chairs are key when creating ergonomic-friendly environments. The right chair will provide the right cushions and appropriate lumbar support through backrest tweaks, adjustable arm rests, a five-legged star base, and depth settings for optimum comfort options. It should be adjustable to raise-up and down, depending on the user's size and any fixed-height restrictions of the work surface. From a maneuverability standpoint having wheels or no wheels might be determined by the floor surface and where else the user may need to reach in his/her work area.

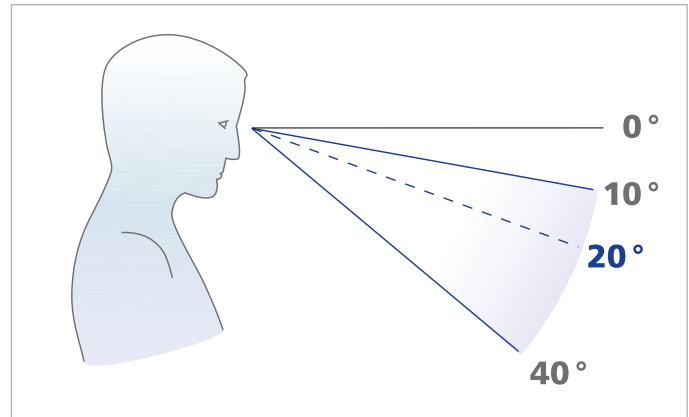
It's important to remember that ergonomics does not create a rigid solution for one particular person. Most production teams have a diverse set of workers. Different physiques, arm length, abilities, skill levels and vision strength have to be accommodated. True ergonomic-friendly work environments are made in such a way to offer flexibility, adjustability and customization. That means the strongly-built, 6'5" male worker may be on the same workstation during shift two as a petite, slender, 5'2" female worker was in shift one. Ergonomic solutions recognize this and offer a solution that can accommodate all body-types.

An ergonomic-friendly work environment is doable. You can start small and take further steps with proven results. Cultivate a healthy work environment and begin to see that with the proper ergonomic foundation, production levels and efficiency will improve.



4) WHERE SHOULD MONITORS BE PLACED?

Monitor should be placed between 20 and 40 inches from a worker's face to help avoid eyestrain and help see on-screen text easily. Its height should be adjusted to 20-30 degrees below eye level and directly in front of the worker, if possible. Multiple monitors mean that each should (?) be turned at 35 degrees. Don't forget that contrast and brightness should be adjusted to suit each individual's comfort level as poorly lit or focused screens may cause additional strain.



5) DOES LIGHTING AFFECT WORK AND HOW?

Visual comfort is just as important as the rest of the body's comfort. Determine if your task requires intense observation of details and needs little to no shadows - in which case, two lights will be favorable. If there is poor contrast between work object and background the better the lights need to be. See if there is daylight and what is its share in different parts of the room. The type of light and fixture will depend on the environment and could mean you should be using LED, low-pressure sodium, mercury or fluorescent lights. Good lighting makes the brain work less to process information and avoids headaches and fatigue.

Normal illuminance, or lux (lx), values in the assembly work are between 300-1000 lx and the so called color rendering index, which tells how well colors are 'reproduced' in our eyes, CRI is 80.

Today, you can even download applications to your mobile, which give you instantly lux values. Check out 'lux meter' from the mobile app store. When more precise evaluation is needed, buy a real calibrated meter or have your vendor measure the environment.

COMPONENTS OF GOOD LIGHTING

Luminances and their distribution (depends on light and surfaces)

Illuminance

Colour rendering index and colour of light

Glare prevention (direct, reflection)

Direction of light (parallelism, glossy reflections)

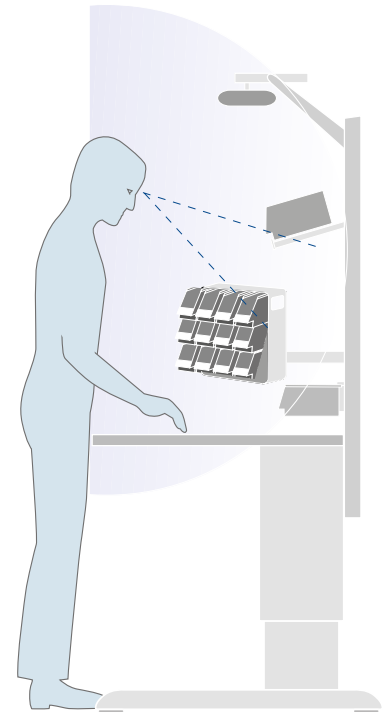
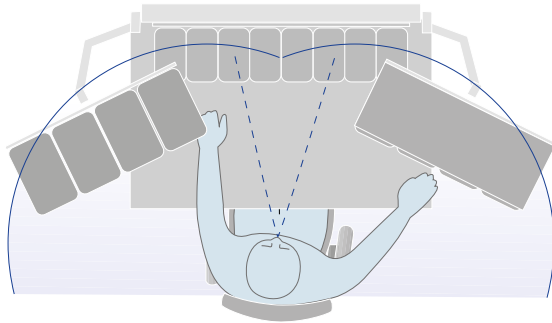
Variation in amount of light

Share of daylight

No flicker (no stroboscope effect)

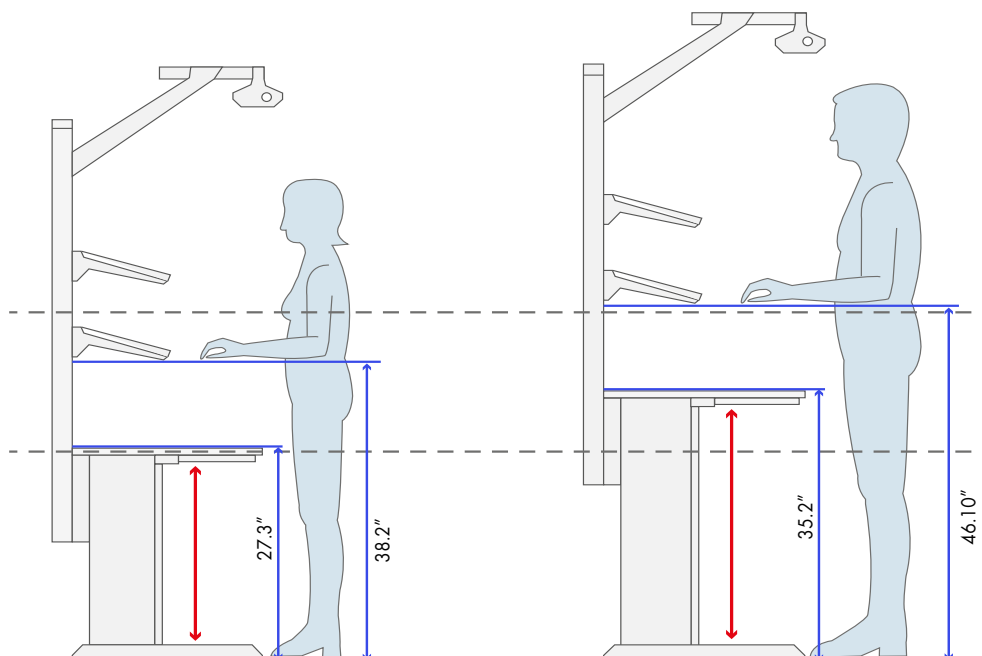
6) OTHER FACTORS

Other factors that should be considered include: keyboard distance, keyboard trays, reach distance for tools and other table-based equipment, if multiple monitors are needed, wrist rests, and placement and tilting possibilities of bins, trays or ramps. Also air conditioning, ventilation and vibrations add into the ergonomic environment. Beyond physical elements, plant managers should routinely encourage that workers have good posture and take breaks to avoid strain, tension and fatigue. Frequent stretching can also help reduce discomfort.



It's important to remember that ergonomics does not create a rigid solution for one particular person. Most production teams have a diverse set of workers. Different physiques, arm length, abilities, skill levels and vision strength have to be accommodated. True ergonomic-friendly work environments are made in such a way to offer flexibility, adjustability and customization. That means the strongly-built, 6'5" male worker may be on the same workstation during shift two as a petite, slender, 5'2" female worker was in shift one. Ergonomic solutions recognize this and offer a solution that can accommodate all body-types.

An ergonomic-friendly work environment is doable. You can start small and take further steps with proven results. Cultivate a healthy work environment and begin to see that with the proper ergonomic foundation, production levels and efficiency will improve.






5

CHALLENGE YOUR VENDORS

Our workplace teams are more diverse now more than ever. From different genders to different cultures, our teams come in all shapes, sizes and abilities. Cross-cultural teams need to be equipped with proper workstations that allow each to reach his/her full potential for productivity. Knowing how your work teams function and operate is critical to implementing the best furniture and equipment that will get the job done efficiently and comfortably.

Then, you must ensure that the vendor you have selected can accommodate those needs. The furniture should have the necessary adjustments to create personalized workspaces. Think about monitor height and distance, chair and neck rest height, desk height, lights, etc. Consider and explore further customizations like device arms and extensions, brackets that position tools in certain positions, and more. Remember, even small improvements can turn into leaps in productivity. Have your vendor demonstrate the functionalities, calculate benefits and give references.

A trusted, ergonomically-thinking vendor can supply workstations with all the needed adjustment possibilities with standard components, without costly extra modifications. And don't just focus on the importance of this in terms of current worker base, body structure or height. Ability to change and modify the environment is just as important. Like many others, your production team is getting older. The Baby Boomer generation still have several years of productive work years ahead but their needs are different from those of younger workers, like Millennials. Maybe they work in the same workstation already now, or maybe that is reality in few years. In any case, you want to create a sustainable, longer-term well-working ergonomic environment which keeps on giving you benefits in terms of healthy productive workers.



“...the workforce is changing so much that nearly one third of it is now over the age of 50.

And for the first time since 1948, employees over the age of 65 are outnumbering teenagers.”

Think about this. In America alone, the workforce is changing so much that nearly one third of it is now over the age of 50. And for the first time since 1948, employees over the age of 65 are outnumbering teenagers. These numbers are increasing. Companies want to keep good quality employees on their team for their experience, loyalty, and maturity. Many are not able to retire yet due to financial reasons. So, this aging workforce requires accommodations. Ergonomics plays an important role here. Customized and adjustable solutions are needed. Take their movements, speed, and vision levels into consideration and create spaces that help them be as productive as possible. Age is more than a number. It could mean extra customizations to enhance the ergonomics of that space.

Also, when working to select a vendor, make sure to choose one that can accommodate your questions and fulfill any custom requests you may have. From a small extra part to an entire custom workstation, see if they are welcoming of the challenge and if they can deliver.



What is the timeframe for this custom station? After all, your employees are still working in their uncomfortable, outdated stations until this vendor can deliver. Challenge your supplier and make sure they can deliver on time, and with care. Check to see if the supplier conducts usability training after the sale for the users of the workstations to get the most out of the investment. And don't forget about installation, support, and customer service. All of these factors should be at play when selecting your partner. Build a solid relationship and choose one that can fulfill your most important ergonomic needs.

Remember, there is no one-size-fits-all option. The very nature of ergonomics means that workstations are built with the end-user in mind to work efficiently and comfortably. Therefore, your purchase for ergonomic-friendly industrial workstations will not be the same as the purchase by the company down the street. Work with a vendor that will help you understand your needs based on your staff, the type of work they are doing, the type of workers, the space available, and more. The best manufacturers or suppliers of ergonomic equipment and furniture will work with you to provide solutions that best meet your needs.

Quality workspaces often make for happier employees. If they feel better, they will work and perform at a higher level. This makes for a more productive, profitable company that can reinvest in its employees in other ways (incentives, benefits, retreats, etc). The workspace plays a critical role in that circular system for creating employee happiness and boosting overall morale.

Did you know that employees who state they are happy at work take 10x fewer sick days than unhappy employees? And 36% of employees would give up to \$5,000 of their yearly salary if it meant they could be happier at work! These statistics are extremely telling on how employee well-being really is the greatest factor for employee satisfaction and retention. From an HR, safety and productivity standpoint, the entire company should be committed to making sure employees are content with the environment and processes. Ergonomics impacts so much more than meets the eye.

It speaks volumes when an employer invests in new equipment that will help workers get the job done easier, better and with less strain. That attitude towards helping staff operate at a more comfortable level can resonate amongst a team.



Consider this. A worker is putting in full-time hours at a particular workstation at 40 hours per week. This equates to about 2,000 hours a year. Now, let's go ahead and subtract the average commute time of one hour and add seven hours for sleep time. Now factor in shopping, trips, vacation, church, and any other typical weekly activities. The result is that the average worker spends more of his/her awake time at the company workstation than any other single area - even more than his/her living room couch. It's overwhelmingly convincing just how important this area is. It should be friendly, favorable - and most important, the worker should feel comfortable working here. Take employee satisfaction seriously. With ergonomics, workers can feel better and be happier during shifts.

According to a study done by the University of Warwick, United Kingdom in 2014, unhappy workers have proven to be 10% less productive, while a happy worker's productivity will spike to 12% greater productivity than the average employee. These statistics also went on to prove that financial incentives alone are not enough to drive employee happiness. Although employees find value in their paychecks, key motivators for happiness are triggered by the employee's work environment - an ergonomic friendly workspace, for example. A healthy workstation helps employees work comfortably without aches and pains.

If happiness of employees is not enough, don't forget the long-term financial effects of a proper ergonomic-friendly work environment. Fewer workplace injuries, reduced turnaround, and greater output. Customized ergonomic furniture may cost more than low quality workstations today, but the investment in the correct equipment will pay for itself with increased productivity and output.



7 MEASURE AND IMPROVE

Even though there are steps involved and some time needed, it can be simple to see how improved ergonomics can eventually hit the bottom line for both the company's pockets and the decision-maker's. As long as you remember to measure and communicate the measurements. Remember to measure speed and output ahead of implementation and then constantly track or re-measure to get a true understanding of productivity growth, and even ROI.

If you're being measured on safety, compare historical injury reports from the previous equipment and workstations vs injury reports submitted after installation of new ergonomic-friendly models. Consider more than just accidents. Think about fatigue issues, headaches or other strains and musculoskeletal disorders. Let safety be top-of-mind once the new stations and furniture has been installed and monitor the effects that have taken place.

Don't forget about more abstract measures too like employee satisfaction and workplace comfort. Consider conducting surveys with employees some time after product implementation to ensure the new equipment or workstations are making a positive impact. It might be hard for employees to describe how they feel, especially with open-ended questions, so it might be best to prepare multiple choice or a sliding scale questionnaire. For example, on a scale of 1-10 (with one being the most severe), describe the discomfort level of your back after logging an 8-hour work shift. Or, do you get headaches at work now - yes or no. If using the same questionnaire before and after implementation, you can understand the direct correlation for any improvements related to injury, pain or discomfort.

Or consider 1:1 interviews again, like you held in the earlier stages of this project. Talk to your team to see how they feel. What are their reactions to the new industrial furniture? What are their fatigue levels like? Do they still struggle with certain tasks the same way they did before? Observe. Document notes and answers and see what has improved.

Let ergonomics be the guiding force in helping make a decision for new workstations and industrial furniture. The return on investment may take time to realize, but the obvious and hidden cost savings will lead to a stronger, more reliable, happier and more-productive employees.

SUMMARY

The Chartered Society of Physiotherapy (CSP) estimated in 2007 that some UK companies lost up to \$4.5 million annually due to suffering productivity. This came as a result of absenteeism, injuries, or employees working uncomfortably. Think about the cost savings if these were only slightly reduced. Now, factor in slower speeds or inefficiencies due to outdated workspaces, tools and equipment and see how throughput is affected. It can be pretty easy to see how ergonomics can have a profound impact on output and make a company function at greater levels.



Though it might be satisfying to wipe your hands and pat yourself on the back after implementation, the process doesn't stop there. You know all too well the never-ending desire for improvement towards near-perfect productivity.

Make adjustments as needed. Take advantage of new technology that may complement and improve your new workstations. Continue to measure and seek out these customizations, add-ons, or improvements on your new stations where needed. By continuing to improve, you will continue to develop a better system that continues to function and produce at the highest possible level, founded upon proper, modern ergonomics.

An ergonomic-friendly workstation project takes an initial investment of research time, budget, customization and more, but turns those investments into an opportunity for business growth. By using baseline data and KPIs to justify your investment decision (both before and after), you'll be able to justify the effect ergonomics has on employees and their work. You can also start small and increase investments with proven results paving the way to continue.

PUT YOUR COMPANY IN THE POLE POSITION

BY PUTTING ERGONOMIC PRINCIPLES TO WORK FOR YOU!

RESOURCES

<http://comfortzone.relaxtheback.com/3021/what-is-stress-doing-to-your-body/>

http://ergonomics.ucr.edu/signs_symptoms.html

<http://www.nbcnews.com/business/careers/americas-workforce-aging-thats-just-fine-n348936>

<https://www.osha.gov/SLTC/ergonomics/controlhazards.html>

<http://www.goldtouch.com/how-to-measure-the-impact-of-your-ergonomic-intervention/>

<https://ohsonline.com/Articles/2012/10/01/Five-Changing-Trends-in-Managing-Workplace-Ergonomics.aspx>

<http://www.orosha.org/pdf/ergo/ergoadvantages.pdf>

<http://ergo-plus.com/workplace-ergonomics-checklist/>

<http://ergo-plus.com/ergonomics-process-support/>

<http://www.futurity.org/work-better-happy/>

http://www2.warwick.ac.uk/newsandevents/pressreleases/new_study_shows/

<http://www.snacknation.com/blog/employee-happiness/>

<http://www.villanovau.com/resources/six-sigma/six-sigma-vs-lean-six-sigma/#.VnhRqsArlwQ>

<http://boxleygroup.com/practice-areas/process-optimization/>

<http://www.kepner-tregoe.com/consulting-services/targeted-performance-improvement/optimizing-lean-six-sigma-infographic/>

<http://www.mayoclinic.org/healthy-lifestyle/adult-health/in-depth/office-ergonomics/art-20046169>

<http://www.cnet.com/how-to/how-to-set-up-an-ergonomic-workstation/>

Ergonomics and Sovella, 2012, Finnish Institute of Occupational Health, <http://www.ttl.fi/en/Pages/default.aspx>

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