

The Effect of Anti-Fatigue Mats

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Introduction

Standing in one place for a long period of time is uncomfortable for most people, not to mention hard on the human body. It is even more uncomfortable to be standing on laminated concrete doing chemistry testing under a fume hood; this is the problem in my laboratory. Through this project, I hope to develop HFE countermeasures to reduce

discomfort while standing static for long periods of time on laminated concrete. There are several options for relief while standing for long periods of time which include using a foot stool, sitting in a chair, and standing on an anti-fatigue mat.

The option which suites my chemistry laboratory best is purchasing anti-fatigue mats. Anti-fatigue mats relieve pressure and discomfort on the spine, legs, and feet making standing for long periods of time more comfortable. The benefits of anti-fatigue mats are countless in addition to providing an overall better working environment for employees.

Background

Working in a chemistry laboratory is a daily challenge. There are toxic, corrosive, and carcinogenic chemicals constantly present, not to mention a variety of other hazards. The challenges for keeping employees safe are numerous and never ending. In addition to that, employees need to be comfortable performing their daily tasks to maximize their efforts and keep the lab performing at an optimal level. In my chemistry lab, one challenge is the flooring we currently stand on. The floor is nothing more than laminated covered concrete which gives very limited comfort and support to the human body while standing.

My lab is set up so there are benches in the middle of the laboratory and fume hoods against two walls. There are four hoods in total which are used regularly for extended periods of time. On a daily basis, one person may be standing at the fume hood for up to 6 hours titrating (a daily wet chemistry test we perform). The titration consists of adding several chemicals together in a flask, waiting for a set period of time,

and then swirling the flask while the reaction occurs. The whole time we are at the fume hood, our arms are held straight, nearly parallel with the floor to complete the testing inside the hood which creates even more strain on the body.

The laminate covered concrete is extremely uncomfortable to stand on for that long of a time period. After an hour or so, we begin to feel the effects of standing in one spot on hard ground. All personnel in the lab have complained or even missed work due to lower back pain, neck ache, back strain, foot problems and general body fatigue after standing at the hood for extended periods of time.

The people I work with are generally uncomfortable asking for enhancements to the lab. They have been working in the current conditions for years and simply think of pain while working is just how things go in a laboratory. After being influenced by this class, I feel it is my duty to show my coworkers a new way of working and a new way thinking. It certainly hasn't been easy, but I have gained the respect of my coworkers and they are increasingly more open to new ideas and positive changes within the laboratory.

Analysis

Standing in one place for an extended period of time has various effects on the body. Leg muscles must work to stabilize the body and standing in a static position requires overuse of the same muscles which leads to fatigue and strain on those muscles. Leg fatigue causes the whole body to feel tired and uncomfortable. Standing in one position while having locked knees can cause dizziness, lightheadedness or

even fainting. Standing in one position can cause the pooling of blood in lower extremities which can result in varicose veins. Feet and ankles tend to swell due to an accumulation of body fluids when standing which may affect feet furthermore if shoes are ill fitting.

The back must also work to stabilize the body which can produce lower back pain and discomfort. The lower back is used all throughout the day and when standing, there is even more stress put on the lower back and spine. The back carries most of the weight of the body and if the muscles in the back become strained, the effects are felt with every movement. It may take several weeks for the pain to subside with a back injury and in that time other areas of the back may become painful do to the overuse they may get while the other muscles heal.

During a group meeting I asked all employees to state physical discomfort they have felt while standing for a long period of time. The responses included:

- Lower Back Pain and Discomfort
- Knee Pain
- Ankle Pain
- Heel Pain
- Ankle/Feet Swelling
- Shoulder Discomfort
- Neck Pain and Tightness

- Foot Arch Aches

After hearing so many discomforts, I decided to make a survey intended to further investigate what the problems were and hopefully how to solve them. I requested the employees of the chemistry lab monitor their discomfort levels while standing at the hoods throughout a week. I sat down with the four employees to discuss their observations and suggestions. Listed below is a summary of our conversation and key points taken away from the discussion.

- Do you experience any symptoms of discomfort while standing at the hood for any period of time?
 - All employees stated some form of discomfort while standing at the fume hood
- Is there a certain length of time where the discomfort becomes worse?
 - Employees gave a range of ½ hour to 2 hours when discomfort was noticed
- What measures were taken to relieve the discomfort?
 - Employees gave a range of answers including the following:
 - Stop and take a break to walk around and stretch leg muscles
 - Switch weight from one foot to the other
 - Bend over at the hip to relieve lower back pressure and discomfort

- Continue working because I have done this for 30 years now and I am used to it
- Would you like to see a foot stool, gel insoles, or an anti-fatigue mat purchased to increase comfort while standing for long periods of time?
 - This was a unanimous “YES”
- Is there one countermeasure that you would prefer to another?
 - Three employees stated the anti-fatigue mat would be the most useful.
 - One employee recommended the gel insoles due to the anticipated expensive costs of the anti-fatigue mat
- Do you think you could be even more effective in the laboratory standing on a mat rather than the floor?
 - This too was a unanimous “YES”
- Any additional comments?
 - Comments ranged from very excited to have some relief and why didn't we do this sooner to mild excitement about a positive change for the laboratory

In general, the back pain was the biggest cause of discomfort. The back is one of the most commonly injured parts of the body, and in my group several employees have stayed home due to back pain. Listed below is a diagram of some of the most

common causes of back pain. For my coworkers, the cause of the most discomfort was in the lower back.

http://www.laserspineinstitute.com/back_problems/

Options

There are numerous different options to improve comfort while standing for long periods of time. There are various types of foot insoles that can be purchased for increased foot and back comfort while standing. Foot insoles are said to ease the discomfort of standing for long periods of time, but have been reported to not be as effective as an anti-fatigue mat. Foot insoles will be recommended to employees for increased comfort, but will not be the only intervention to improve comfort while standing. Another discussed option was to purchase chairs to use at the fume hood rather than standing.

There were several unfavorable issues that come with purchasing chairs. First there is a safety hazard of spilling a chemical and not being able to move quickly enough to get out of the path of the spilling chemical. The result would be chemical all over the lap of the person. When there is a chemical spill in the hood, the chemicals run out of the front of the hood to prevent them from running down the back of the hood where they cannot be reached for cleanup. There is no place to knees or legs under the hood as there are cabinets for chemical storage which would create a whole new HFE issue.

A different option would be to purchase foot stools. Foot stools allow for one leg to be slightly elevated (~6 inches) resting on a stool. The thought behind this is to relieve one leg at a time and encourage leg movement while standing. Frequent leg movement reduces discomfort on the lower back and legs as it allows the muscles to move and stretch from their static position. Having one leg on a stool relieves pressure on the lower back, further reducing discomfort.

The best option for my laboratory is purchasing anti-fatigue mats. My proposal is to purchase anti-fatigue mats to put in front of each fume hood. Anti-fatigue mats are specifically designed to reduce the discomfort of standing on concrete and hard surfaces. The mats are purposely designed to aid in comfort while standing for long periods of time and are anticipated to have a great impact on our comfort levels.

Intervention

There are several problems that arise with my proposal of anti-fatigue mats. The first is the type of chemicals we use. There are caustic, highly acidic, and highly basic chemicals all over the lab which may react with the anti-fatigue mats causing toxic odors or corrosion of the mats. Another challenge is the traffic these mats will get. We each have a cart we take all over the lab to safely move glassware and to collect chemicals for testing. The anti-fatigue mats need to have a gradual edge to allow for easy cart movement across the mats.

Finding a mat that is suitable for the needs of the chemistry laboratory was surprisingly easy. There are several available suppliers for anti-fatigue mats and I

chose to purchase the mat from a familiar supplier called Lab Safety Supply (lss.com). The mat I am going to purchase is specifically designed to be chemically resistant, it is flush with the floor with a gradual slope to the maximum height to allow for easy cart movement across the mat, and it is easy to clean due to the vinyl coating. In addition to providing comfort while standing, the mat will also help soften the impact of dropped glassware. Currently, when glassware is dropped, broken glass is shot all over the laboratory because of the hard surface it lands on. The anti-fatigue mats will buffer the fall and hopefully result in less broken glass cleanup, and safer conditions when glass does fall. In addition to the mats, I have also looked into alternate ways to improve comfort while standing for a long period of time.

Listed below are several suggestions to increase comfort in addition to standing on anti fatigue mats.

- Frequently switch weight from one foot to the other
- Wear comfortable and supportive shoes which are big enough to allow room for socks
- Take breaks frequently and walk around
- Purchase gel insoles
- Buy socks that fit well
- Stretch during frequent breaks

- I placed a couple small posters with suggested stretching exercises around the lab to encourage stretching on breaks
- Exercise to build up strength and stamina
 - My company has a 10 week program starting the second week of august called “Active for Life” which I signed up myself and coworkers for as a team. We will be encouraged to work out on a regular basis for a chance to win prizes and lose weight together, as a team. I think this will help with the discomfort felt in the lab by building up muscle and stamina.
- I discovered if we open the storage unit below the fume hood, the ledge works perfectly as a foot rest. This in combination with the anti-fatigue mats will help ease discomfort

Conclusion

Standing in one place for an extended period of time is uncomfortable no matter what the surface type is under your feet. From discussions with my coworkers, I did not see a trend in how long one can stand comfortably on concrete; it seemed to be a person by person case. Each person did, however, mention some type of pain and discomfort from standing on concrete at the fume hood while doing testing. With this in mind, I held a meeting with my coworkers to encourage them to take more breaks and take care of themselves better at work. I stressed the importance of stretching and moving often as well as wearing appropriate shoes and socks. I encouraged any and

all suggestions on how to make our laboratory more comfortable and suitable for our daily needs.

I will be purchasing the anti-fatigue mats the first week of August due to near limit budgets for purchasing in the month of July. I know once we get the mats, there will be a very positive for the chemistry laboratory and am excited to see how the lab improves as a result of such a minimal change. I am still surprised the lab has never had anti-fatigue mats before, but am glad to be the one to implement this change. I anticipate less pain and discomfort while working at the hoods. I cannot change the time we spend at the fume hoods, but I can change the flooring we stand on as well as the culture of “work work work” with no thought on the effect that has on the human body.

I approved through my boss an extra time slot from our on campus personal trainer to lead our group in stretching exercises for three minutes in the late morning on Fridays. For me, this project wasn't just about picking one HFE issue and “fixing it”. I wanted to take this opportunity to intensely look at the chemistry laboratory and really make an impact in the way we operate. I'll admit I told my boss this project was to cover more than just buying a mat. Using this class as my justification, I included several different HFE countermeasures to further increase comfort while working in our laboratory. I think my group is motivated to continue to make work a healthier, safer, and more comfortable place. The ball rolling and as long as I have a say it's not going to stop.