

ERGONOMICS DEMONSTRATION PROJECT

Update

Hop Growing, Harvesting And Processing

January 2002



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Introduction

Following the adoption of the Ergonomics Rule in May 2000, John I. Haas, Inc., a hop grower, approached the Department of Labor and Industries (L&I) about working on a demonstration for their industry. Hop growing is not one of the first 12 industries that must comply with the earliest dates in the Ergonomic Rule's phase-in period. A large hop grower (employing more than 50 annual FTEs) must complete awareness education and hazard analysis by July 1, 2003, and must implement hazard controls by July 1, 2004. Growers with 11 to 49 FTEs have one additional year to complete each of these requirements, while growers with 10 or fewer FTEs have two additional years.

The project began with an evaluation by L&I ergonomists of steps that the company had already taken to reduce risk factors during harvest, which included mechanization of several processes. A few jobs that still have risk factors were also noted during the evaluation. The project then went on to evaluate the seasonal jobs of digging up hop roots for transplanting, tying up the lengths of twine that the hop vines grow on, and training the young vines to grow up the twine.

Caution Zone Jobs

John I. Haas staff identified jobs that were thought to have risk factors that would make them "caution zone jobs" as described in the Ergonomics Rule. L&I ergonomists confirmed the level of exposure to risk factors through videotaped analysis of the work and discussion with John I. Haas staff. The rule requires that employees working in these jobs, and their supervisors, receive ergonomics awareness education. It also requires that employers work with their employees to do a hazard analysis of these jobs. But the jobs do not need to be modified in any way unless that analysis indicates that they exceed the hazard level. Table 1 shows a list of the caution zone jobs found.

Table 1. Caution zone jobs in hop growing

Season	Job	Risk Factors
Early Spring	Digging roots	Awkward Postures: Working with the neck or back bent more than 30 degrees (without support and without the ability to vary posture) more than 2 hours total per day Awkward Postures: Kneeling more than 2 hours total per day.
Early Spring	Twining	Awkward Postures: Working with the hand(s) above the head, or the elbow(s) above the shoulder, more than 2 hours total per day Highly Repetitive Motions: Repeating the same motion with the neck, shoulders, elbows, wrists, or hands (excluding keying activities) with little or no variation every few seconds more than 2 hours total per day
Mid-Spring	First training	Awkward Postures: Working with the neck or back bent more than 30 degrees (without support and without the ability to vary posture) more than 2 hours total per day Highly Repetitive Motions: Repeating the same motion with the neck, shoulders, elbows, wrists, or hands (excluding keying activities) with little or no variation every few seconds more than 2 hours total per day
Early Fall	Harvest – Hop vine feeding operation (loading the hop picking machine)	Awkward Postures: Working with the neck or back bent more than 30 degrees (without support and without the ability to vary posture) more than 2 hours total per day Awkward Postures: Working with the hand(s) above the head, or the elbow(s) above the shoulder, more than 2 hours total per day Highly Repetitive Motions: Repeating the same motion with the neck, shoulders, elbows, wrists, or hands (excluding keying activities) with little or no variation every few seconds more than 2 hours total per day
Early Fall	Baling – transferring burlap	Awkward Lifting: Lifting objects weighing more than 25 pounds above the shoulders, below the knees or at arms length more than 25 times per day

Hazards and Controls

John I. Haas also believed that several of these jobs could have a higher exposure to these risk factors, placing them at a hazard level. This was confirmed through videotaping and analysis of the jobs by the L&I ergonomist. Under the ergonomics rule, these hazard zone jobs will need to be changed so that the risk factors are reduced below the hazardous level or to the degree feasible.

Where hazard level exposures existed, several potential controls were proposed, and through discussion with John I. Haas, the feasible controls for each job were selected. Hazardous exposures and controls for these jobs are shown in Table 2. See the Discussion section for an explanation of the hazards and controls.

Table 2. Hazards and Controls in Hop Growing

Job	Hazard	Possible Controls	Controls Chosen
Digging roots	Working with the back bent forward more than 45° (without support or the ability to vary posture) more than 2 hours total per day Kneeling more than 4 hours per day.	<ul style="list-style-type: none"> • Use 5-gallon buckets and bucket seats to create lightweight, portable seats. Also, use lightweight tables as portable cutting and counting surfaces. • Consider alternative tool designs for digging, including drain transplanting spades, forks, or shovels with built in lever arms. • Explore other technologies, such as low-pressure water jets, for digging up roots. 	Portable seats and cutting tables built in-house to allow organizing, cutting and counting of roots to be done while seated instead of bent over.
Twining	Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once per minute more than 4 hours total per day	<ul style="list-style-type: none"> • Using clips to attach twine to cables, tie all of the twine for each section at one time, while stationary, and then slide them down the cable into place. Raise the platform so that workers are tying with their hands lower. • Actively rotate jobs between working on the platform, working at ground level, and driving the tractor. 	Cross-train more workers for tying up top, so that workers can rotate approximately every two hours. This control will be used until a workable mechanized twiner can be developed.
First training	Working with the back bent forward more than 45° (without support or the ability to vary posture) more than 2 hours total per day		The project is working to identify feasible controls.

Table 2. Hazards and Controls in Hop Growing
(continued)

Job	Hazard	Possible Controls	Controls Chosen
Vine feeding	Working with the back bent forward more than 45° (without support or the ability to vary posture) more than 2 hours total per day Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once per minute more than 4 hours total per day	<ul style="list-style-type: none"> • Change the process, improve existing machinery, and introduce new automation to eliminate the vine feeding operation. 	John I. Haas is currently evaluating two different processes, each of which would eliminate the risk factors in this job.
Baling – transferring burlap	Heavy, frequent, awkward lifting	<ul style="list-style-type: none"> • Take smaller amounts of burlap each time. • Use two people to move burlap. • When sorting burlap, use slip-sheets and stickers to separate into a day's worth of burlap in each stack. Then, use a forklift to transfer. 	Take smaller amounts and/or use two people to move the burlap.

Discussion

Several jobs reached hazard levels, and for most of them simple solutions were readily identified. Each job is discussed separately below:

Digging Roots: While digging appears to be the most strenuous single task in this job, it actually occupies a short amount of the overall time. A majority of the time is spent organizing, cutting and counting roots, which is currently done while kneeling and bending at the back. Providing a lightweight seat and table combination will allow workers to perform these tasks while seated upright. John I. Haas plans to construct prototypes of the seat and table and test them in the upcoming season. Many of the suggested alternative tools for digging have already been tried and found ineffective. Use of water jet digging tools was thought to be too time consuming, and therefore too expensive. Although not necessary for rule compliance, the project will continue to try to identify workable controls for the digging task.

Twining: The job of tying twine to the cables that run between the hops poles is the only task that reaches hazard levels. This job is done by two workers standing on a moving platform, while one worker drives a tractor that tows the platform, and four workers follow behind and fix the twine into the ground next to the hop hills using clips. The only risk factor of concern for the rule is repetitively reaching overhead when tying the twine to the cables. The jobs of clipping the twine into the ground and driving the tractor are both significantly different from the tying job, with none of the same risk factors present. The employer decided that job rotation would be the best available solution. Additional workers would need to be trained in the tying job, but if six out of seven of the workers on a crew could be rotated every two hours, then twining could be done for a 12 hours a day and still be below hazard levels. Each of the six workers would spend four hours tying, and eight hours either clipping twine into the ground or driving the tractor.

First Training: Training involves taking hop vines and wrapping them around the twine that supports them as they grow. In first training, workers bend over the pick up vines that are growing along the ground, and wrap them around the twine to a height of two to three feet. Since the hop hills are so close together, workers do not stand up between each one, but instead stay bent over. Vines must be trained, or else they do not produce as many cones, and the cones mature at different rates, so that the harvest quality is affected. The vine heads are delicate, so using a tool to pick them up, as was suggested, appears to be unworkable due to the damage it could cause to the vine. Because the workers need to move around both sides of the hop hills, the cart idea also appeared to be unworkable, since it would limit their mobility too greatly. The project will continue to evaluate possible controls until a feasible one is found, or until all possibilities are exhausted.

Vine Feeding: As vines are harvested, they are brought to a picking shed, where they are loaded by hand onto a line that takes them into the picking machine. The vine feeders or vine hangers, as this position is called, bend down to pick up the vines off of the trailer that brings them in, and then reach up to clip them onto the line that runs just overhead. Over a quarter of the time is spent bent at the back, while about half of the time is spent reaching overhead. Therefore, this job is likely to contain hazards if worked for eight hours per day or more. While further analysis has not yet been done to confirm this, John I. Haas plans to change this process so that vines are cut into shorter lengths and brought into the picking machine mechanically, so that these risk factors are eliminated. Haas is currently considering two options – creating the necessary

machinery in-house, or contracting with an outside company to customize the necessary equipment. Initial estimates are that this changeover will take a few more years of development and implementation, and will be fairly expensive. While the change would result in labor savings and elimination of the hazardous risk factors, payback on the investment would still take several years.

Baling – Burlap Transfer: Hop cones, once picked and dried, are baled in burlap in order to be shipped to the processing plant. Once per day, the burlap is transferred from a large storage pile to a smaller working pile. Several pieces of burlap are lifted at one time, from below knee level and while twisting.

Project Tasks Still Pending: A few more jobs, such as burlap sorting and some of the harvest tasks, still need to be evaluated and solutions chosen. In addition, meetings are being scheduled with the help of the hop industry association in order to recruit other hop growers to join the project. This will help in generalizing the findings of the project and ensuring that the controls identified will work for growers of all sizes. The feasible controls that have been chosen so far still must be evaluated in the field, and workers need to be involved in reviewing the project's findings and evaluating the controls. Once the project has successfully covered the jobs that are a concern to the industry, a final report will be written and distributed through the industry association and the L&I web site.

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