

November 19, 2001

Oregon Department of Consumer and Business Services  
350 Winter Street NE, Room 430  
Salem, Oregon 97310-0220

Regarding Worksite Redesign Grant Agreement #97/99-32  
Final Summary

The goal of this project was to significantly reduce the severity and frequency of injuries and employee turnover in the pouring and shakeout area of the mechanized foundry at ESCO Corporation in Northwest Portland.

In the mechanized foundry employees run a variety of molding machines using green sand and patterns to fashion molds. The molds are placed on carts setting on tracks, the carts are pushed down the tracks onto the pouring floor. Two employees on the pouring floor place a metal jacket weighing from 65 to 105 pounds, around each mold. Up to twelve (12) forty eight pound weights are placed on top of each mold to hold the sand together when molten metal is poured into it. A large ladle of molten metal is brought to the edge of the pouring floor, a small ladle on an overhead track is filled from the large ladle. The small ladle is pulled around on the overhead track, the molds are filled from this ladle and manually pushed down the floor toward the shakeout area. The jackets are removed from the molds; the molds are mechanically tipped onto the shakeout system. The castings are separated from the sand, the sand is reclaimed and the castings are taken to another part of the foundry to be finished.

The problems that were addressed using funds from the grant were:

The weight of the jackets and the need to:

- Lift, carry, and place the jackets

- The force needed to remove the jackets from molds

The weight and size of the weights

The forces and awkward postures needed to push molds on tracks

The turn over rate for new employees in the Pouring and shakeout area :

1997 75%

1998 78%

The turnover rate for new employees in the other departments at ESCO Corporation

1997 22%

1998 18%

In 1998 the pouring and shakeout area employed 2.5% of employees at ESCO Corporation with 19% of disabling claims and 13% of total claims.

The worksite redesign team, (engineers, safety director, occupational health nurse, ergonomist, supervisor and employees from the pouring and shakeout area, outside vendors and others as needed), began meeting in January of 1999.

## MOLD CARTS

One of the first major focuses was the force needed to the push the mold carts on the track. Due to space limitations, costs, molten metal, and the need to keep the tasks basic, easy to use and maintain, major changes were not practical. An employee from plant fabrication suggested a 2 or 3-week trial, using larger wheels on the carts. At the same time a device called an Easy Mover was ordered. This small air driven device will be tried as a possible way to move carts on the tracks. Research continued on other methods that might be tried.

The Easy Mover could not be used, as the wheels could not get enough traction on the floor to be effective. The larger wheels on the mold carts, along with better bearings in the wheels, reduced the force needed to start the carts moving and to keep them moving. The employees in this area reported an immediate improvement. In addition, the concrete floor under the tracks was replaced and the tracks were repaired or replaced. Housekeeping is stressed in this area, keeping the tracks free of debris is a major focus.

Based on ergonomic analysis, the pushing force necessary to move the mold carts has been reduced on average by 27% (initial force). The sustained force, on average, has remained fairly constant at 35 lbs. However, due to the improvements, the force remains constant over the length of the push.

## JACKETS

The redesign team investigated the weight of the jackets and the force needed to break them loose from a mold as another major focus. (The force needed to remove the jackets caused most acute injuries). An outside vendor, the department supervisor and the occupational health nurse, investigated using other, lighter material for the jackets and a release mechanism to make the jackets easier to remove from the molds.

The material currently being used for the jackets is the most durable, lightest and least expensive available. In addition, ESCO engineers reported that the material currently being used was the lightest that could be used in our processes.

Several suggestions for jacket release were investigated or tried. The manufacturer of the jackets reported that a small spring could be inserted at the edges of the jackets. The spring allows a small amount of expansion when placing or removing the jacket, without interfering with the integrity of the casting. (The manufacturer did not make it a practice to include springs with the jackets). The springs can be purchased at the hardware store for a few cents a piece. The force necessary to break a jacket loose from a mold was reduced by an average of 47%.

## WEIGHTS

The redesign team investigated the size and shape of the weights that are placed on the molds. (The weights look like an old flat iron). Several changes were discussed or tried. Engineers had tried to reduce the number and size of weights in the past so had some data available. Experience demonstrated that the size and type of mold and casting determine the size and amount of weight needed. One of the areas on the weights that could be changed was the diameter of the handle. This was changed from 1.5 inches to 1.25 inches, making it easier to pick up with a gloved hand. The employees report a significant reduction in hand fatigue.

## TRAINING VIDEO

A training video was produced “Safety on the Doghouse Pouring Floor”, the video stresses training on changes made as a result of the redesign project, best practice and safety tips.

## SUMMARY

Comfort surveys were done before and after the changes, the employees report a significant improvement in most areas. (Comfort survey and result are attached)

The frequency and severity of injuries has changed as follows:

1999 3 % of total of shop employment      6 % of total workers compensation claims

2000 3 % of total of shop employees      6 % of total workers compensation claims

2001 3 % of total shop employment      2.8 % of total workers compensation claims

The turnover rate in 2000 and 2001 was less than 20%.

There has been a significant overall improvement in forces and loads, however due to the nature of the work, challenge remains to look for opportunities to make future improvements.

