CENTER FOR MICHIGAN AGRICULTURAL SAFETY & HEALTH

MICHIGAN STATE UNIVERSITY'S COLLEGE OF HUMAN MEDICINE & COOPERATIVE EXTENSION SERVICE

Environmental Control Technology can Reduce Health and Safety Problems in Agriculture

Much of the agricultural production work in the United States is done outdoors; however, many tasks are done indoors. For example, animals are kept indoors in confinement operations; fruit sorting and packing work is sheltered or performed indoors; most plant nurseries are inside operations; and maintenance and repair tasks are done inside buildings or under shelters whenever possible.

Consideration for animal and plant welfare should be a major concern in farm building design because produce is the revenue source, but the health and safety of the people who work inside the same buildings or shelters also have to be considered.

Technology has done much to improve the environment indoors for people, animals, and plants, but there arc still many problems when people and animals or people and plants have to share the same environment.

Safety should be foremost in any new design plans for buildings and machinery or equipment, but comfort is also a controlling factor. Animals and people both perform better when comfortable and better performance increases the chances for safer farm work.

The level of comfort of an individual person or animal is influenced by environmental conditions such as climatic atmosphere, space, and light. Over many centuries engineers have endeavored to make work easier. Modem developments have done much to improve the working environment for agricultural operations.

Climatic Comfort

There are four important climatic factors:

(1) air temperature
(2) air velocity
(3) humidity
(4) radiation temperature.

Air temperature is controlled by air conditioning and heating and much of today's modem outdoor farm equipment is equipped with air conditioners. This contributes to safety because enclosed cabs and filter systems on air conditioning systems reduce the amount of dust, spores, and potentially toxic particles breathed by machinery and equipment operators. In the summer, air conditioning allows longer work periods without endangering health due to dehydration, sunburn, sun stroke or heat exhaustion, and fatigue.

The most efficient operating temperature and conditions for humans is rarely the same as temperature and conditions for animals. Because comfort for the animals is important for production, people have to find ways to make working in animal environments more acceptable. Some ways to reduce exposure or exposure time include:

- Using mechanical help to reduce the time spent in an animal-dominated environment.
- Rotating chores among workers whenever possible.
- Using special clothing and equipment, such as dust filters or a respirator, when necessary to protect oneself or to provide more personal comfort.
- Separating human work areas from areas where the animals are kept. Separate rooms with conditions set for human comfort allow workers to be close to the animals without spending all

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their work time in the animals' environment.

- Keeping up-to-date on new developments and enlisting the help of Cooperative Extension Service and animal environment consultants to determine what changes can be made and how to make them in a specific enterprise.

Lighting

Technology has helped us develop artificial lighting. Most indoor work requires artificial lighting and artificial illumination is provided on tractors, combine-harvesters, and other machinery for work after dark duringperiods of peak activity.

Four aspects of lighting should be considered whether artificial illumination is employed or daylight through windows is used.

(1) Intensity
(2) Contrast
(3) Glare and flicker
(4) Color

Light intensity is measurable and is expressed in lux (lumens per square foot). For efficient work, the required level of illumination will depend on:

(a) the size of objects with which a farmer works.
(b) contrast between the objects and the immediate surroundings.
(c) reflectivity of the object.
(d) time allowed for seeing the object.
(e) the age and visual health of the worker.

All tasks on the farm will not require the same amount of illumination nor the same type of illumination source.

Contrast is used to help distinguish between the objects of importance (the work piece) and the background. Avoid sharp contrasts, especially for work in animal areas where shadows can cause animals to spook.

Glare occurs when the field of view contains areas of high brightness that interfere with vision of the normal task. Limited amounts of glare may cause only annoyance, but unexpected bright glare may be a hazard if a worker is temporarily blinded.

Causes of glare include:

- direct sunlight,
- bare lamps,
- reflections of light or bright sources in glossy or highly reflecting surfaces, such as glass or mirrors, and
- excessive differences in illumination of adjacent areas.

Flicker is annoying, especially when noticed in the peripheral line of vision. Fluorescent tubes can cause noticeable flicker. Flicker may also be more noticeable with bluer lamps than with tedder ones. Besides being annoying, flicker can cause headaches.

Discharge lamps such as florescent lights can Rose a serious danger when serving as the source of light in areas where rotating or reciprocating machinery is used. The stroboscopic effect occurs when the machinery rotates but appears to be slower moving. The optical effects with moving objects and this type of lighting can be deceiving.

Color of illumination can be used to advantage for contrasting the work task or to psychologically enhance the working environment. Some colors are considered to be "cool" colors while others are "hot" colors. Temperature effects can be changed by the use of color without changing equipment or control settings.

Colored light is also helpful when used to help mark obstacles or highlight controls, such as red for emergency purposes.

Colored light can be harmful when it distorts natural colors, lowers contrast, or decreases working efficiency. In these situations colored light indirectly increases the risk of injury.

Remember that human eyes do not see all colors equally well and that different animals are sensitive to different colors.

Computers and Programmable Electrical Controllers

Computers are playing an increasingly important role in agricultural work. Safety is enhanced while the drudgery of various types of farm work is reduced. The list of uses for computers in agricultural applications is continually growing.

Computers and controllers are used to control equipment designed to maintain climatic comfort inside buildings. Ventilating systems and fans, furnaces, and air conditioners are turned on and off according to preprogrammed temperature and humidity settings.

Computers and/or programmable motor controls can be programmed to control lights.

Computer-controlled operations such as feeding and cleaning reduce the chore time workers spend in animal housing environments, minimize the amount of fertilizers and pesticides placed in the field, and help sort and grade fruit.

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