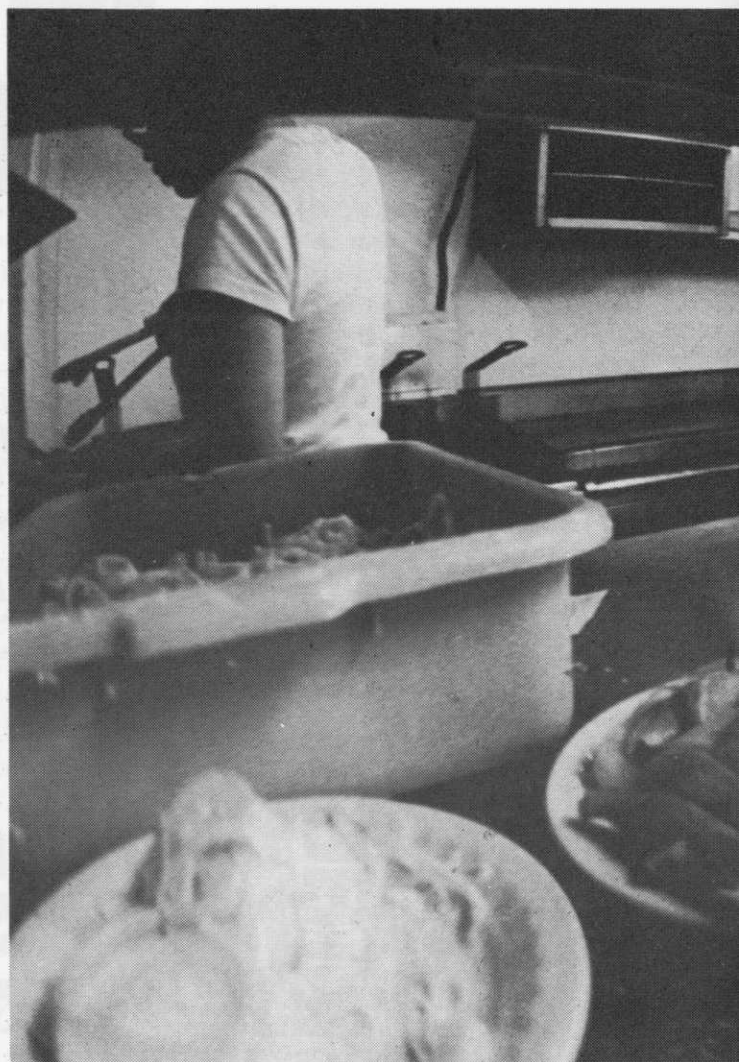


Human engineering makes happy — and efficient — kitchen workers

by Arthur C. Avery, Ph.D.



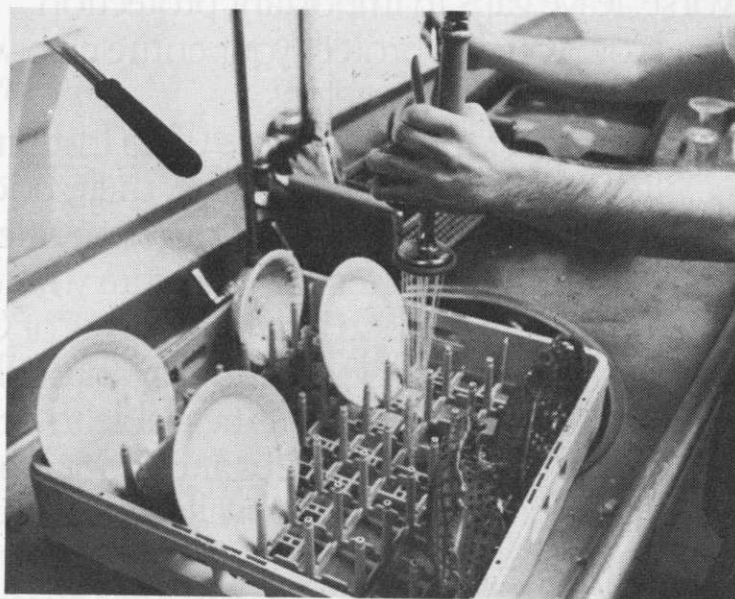
The kitchen has been the forgotten stepchild of American foodservice. Designed largely by people who have never worked in them, foodservice kitchens have been notoriously unpleasant places in which to work. Employee turnover has been high and has reached 400 percent per year in some cases, while productivity per worker has been very low.

However, a number of restaurant chains have found that they can improve worker productivity and, to some extent, employee turnover rates, by application of industrial engineering techniques to improve methods and human engineering to improve the working environment. It is the latter we'll discuss in this article.

Unions and other worker-oriented groups will devote a considerable portion of their efforts to improving quality-of-worklife (QWL) as they see this as an important part of worker satisfaction and productivity. Human engineering of the worker environment is one way of achieving this.

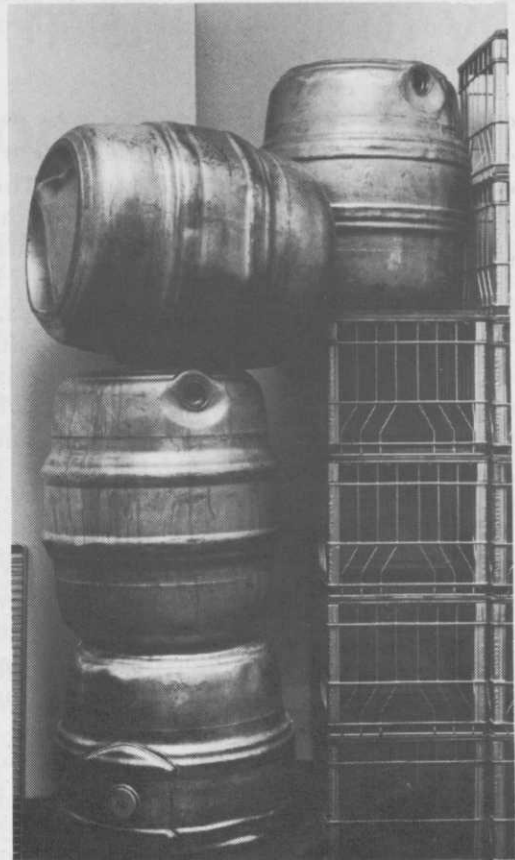
Kitchen atmosphere

Sanitary white or non-dirt-showing black are undesirable and should never be used in kitchens. Preferable as kitchen colors are soft yellow or peach, as they show both the worker's skin and the food in more lifelike colors. Walls should have about the same light reflectance as the skin



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(about 50 percent). The white or off-white ceiling should reflect 80 to 85 percent of the light that strikes it, and the floor should reflect over 25 percent.

Lighting should be glare-free and provide a minimum of shadows. While 50 footcandles on the worksurface is satisfactory, some states require 70 to 75 fc. At the clean end of the dishwasher where films on dishes must be checked or in the office where columns of fine figures must be added, 100 fc may be used. Storerooms can get by with 30 fc and hallways with 10 to 20 fc. In fine dining rooms, incandescent lights are best, but in most other foodservice applications, fluorescents with a pink tinge are best from a worker standpoint.

Too much light must be avoided, as it reflects off the shiny stainless steel and aluminum and causes eye-tiring glare. The stainless steel should be satin-finish: No. 4 except in serving lines, where No. 7 may be used.

The floors should be of nonslip materials. Among these, terrazzo tile with a light grit surface is best for most kitchen applications. Heavy grit should be used where much soil or grease accumulates. A few restaurants are using rubber-backed carpets in most kitchen locations as they find it is nonskid, is easier on workers' feet and backs, lowers kitchen noise, and may pay for itself in a year in reduced dish breakage. Before one considers this, the laws of local health departments should be checked.

The kitchen temperature should be set to keep the worker's skin at 91 to 93° F. To do this, a few operators are air-conditioning kitchens as they find it adds about 15 percent or more to the worker's productivity in the summertime. In places where this is not possible, many restaurants use air exchanges from outside the kitchen. The least

desirable method is to draw the stale air from the dining room, and the most desirable is to have an inlet fan on one side of the kitchen and an exhaust fan at the top of the wall on the opposite side. The exhaust fan plus the hood exhaust in total should be slightly greater in air handling volume than the intake so that the kitchen is kept under slight negative pressure. This will obviate the kitchen odor migration into the dining room.

Some kitchen ventilation is limited to the hood exhaust. Under these circumstances, fans are used to improve working conditions by evaporating the worker's perspiration. Under these deplorable conditions, care should be taken to have the fans blow on the fronts of the workers' bodies as they have twice the number sweat glands there that they have on their backs, where most fans are directed. Lowering the kitchen humidity with dehumidifiers in summer helps to make poorly ventilated kitchens more bearable.

Noise, too, must be considered. High kitchen noise levels cause tension, tiredness, and high accident rates. Communication is made very difficult. Noisy pieces of equipment should be isolated in rooms adjacent to the kitchen or the noise should be dampened by the use of batts of fiberglass. Acoustic ceiling tile can be used where allowed. Undersides of tables, particularly those in the dishroom, and pot-washing drainboards can be coated underneath with a mastic that will dull the clatter. Plastic mats over table-dish contact surfaces helps as well. In severe cases of noise, coarse material can be hung in a sound-trapping honeycomb overhead. One college hung carpets on the walls of a noisy dishroom while others have hung coarse washable draperies.

Use of plastic dishes dulls dish clatter, while careful

handling of dishes lowers noise. Under no circumstances should dishroom personnel be permitted to dump dishes out of busing boxes onto steel tables.

Work center design

Work center design must consider the worker both as a mechanism and as a flesh-and-blood human. There is a set of conditions where each worker is most productive, and average conditions under which most workers are effective. For example, the worker does light work best if his body is comfortably erect, his upper arms are at his sides, and lower arms are parallel to the ground. His work should be one to three inches below elbow height. Higher than this forces his upper body back, and a lower work level causes him to lean forward. In either, muscles are kept tensed and thus tire quickly, forcing the worker to pause frequently. Light work tables for women should be adjustable in height from 37 to 39 inches and for men they should be 39 to 41 inches. Because of the need to throw the back into the work, heavy work tables should be at a height where the wrists bend when the arms are hung by the side, or 34 to 36 inches. This height is also fair for using tabletop devices. A better height for these is one where the loading or operating height is slightly below the elbow.

Most kitchens have no provision for workers to be seated while working, as they are thought to be more productive when standing. Such is not true — as research has proved. If the worker is to sit at least part of the time, he should have a chair that can be used at a light work table. The seat should be adjustable between 24 and 31 inches from the floor and be on a swivel. A foot support should be flat in design and placed in front of the seat. The chair back should be about 13 inches wide and 8 inches in depth and be adjustable so that it just makes contact with the back below the shoulder blades when the body is in working position.

Sitting at a table which is 28 to 30 inches high, the seat should be at a height where the under side of the legs with feet planted in front of the seat just makes contact with the front edge of the chair. The seat should incline slightly to the rear. The front edge of the seat should average about 15 inches for women and 16½ inches for men. Form-fit seats should not be used, as all forms are not the same. Seats should be flat and made of hard padding covered with non-slip material.

Drawers are wasteful of worker time and are damaging to the tools which are kept in them. More to the point for equipment storage is the use of shelves over the work area with those tools used by the right hand placed on shelves over the right side of the area, and those used by the left hand placed over the left side of the area. Again, checking should be done, for some sanitary regulations prohibit utensil exposure.

The work area itself should be laid out with the bulk of the work within 24 to 26 inches of the worker's belt buckle in an arc of about 70°, as this is about as much as the eyes can see accurately without turning the head. One sees best in an arc of about 30° directly in front of the head.

Pot sinks are often back-breakers with bottoms 12 to 14 inches from the floor. Actually, the sink bottoms of the wash sinks should be at thumb-tip height when the arm hangs by the side, or about 27 inches from the floor for women and 29



inches for men. Soak sinks can be about 6 inches deeper if small utensils are not placed in them. The front edge of the sink should be below elbow height, or 37 to 38 inches high, and should not be over 2 inches wide.

The front edges of steam jacketed kettles should not have the rim over 36 to 38 inches from the floor and the draw-off should be high enough to allow most pots to be placed under it.

Stacking of roasting ovens three high should not be considered, as the top deck is too high for a short man to see into the roasting pans and the cooks burn their bare arms on the drop-down door while reaching into the oven compartment. The bottom oven is equally difficult to use as the cook cannot see into the oven and burns himself on the top of the door frame. The top and bottom decks are used but 25 percent of the time. Much better is using two decks and placing them on a 20-inch base.

The work center is best arranged so that the worker can move from left to right around his work area as he progresses on preparation of the food. To avoid unnecessary walking and carrying, it is best to have work tables beside ranges, griddles, fryers, mixers, and similar equipment. Steam jacketed kettles can have hang-on shelves or tables beside them. Ovens, refrigerators, steamers and broilers should have tables in front of them for one motion loading and unloading. In addition to the work table, the ranges should have a sink and water source beside them to avoid having to carry heavy and dangerously hot pots around the kitchen.

Design for the older worker

Many a foodservice operator who complains about the shortage of capable workers would find a ready supply of older, eager workers if he would but plan for their use. Actually, the 60+ worker is more productive than the 18-to 25-year-old worker, but he needs a little special consideration. He doesn't see as well as when he was younger, he needs a little more warmth, he can't lift as much and may be slightly farsighted, deaf, and forgetful.

To provide a productive environment for him, first give him his instructions in writing. Raise his room temperature to 75° to 80° F. (fuel supply permitting). Increase his lighting 10 to 15 footcandles and keep him out of a noisy room. He will not be able to carry heavy loads, but he'll surprise you in that his arms will still be strong. He will produce well, have few accidents, and probably be absent very seldom because, in many cases, your job may be the last that is offered to him.

In conclusion, it is well to remember that what was covered here barely skims the surface of what can be done by good human engineering to increase the productivity of the foodservice worker. Just knowing that someone thinks enough of him to go to this trouble will help to some extent, and the labor saving measures will help even more. □