RAPISTAN'S HUMAN ENGINEERING EFFORTS

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I have been asked to comment on Rapistan's efforts in the area of human engineering. Before doing this, I believe a couple of explanations are in order.

First, What is Rapistan?

We are a 42-year old conveyor company located in Grand Rapids, Michigan. Approximately half of our annual sales come from our overseas companies, most of whom have their own manufacturing facilities, as does our company in Canada.

Rapistan is the largest company of its kind anywhere. While we are involved with practically every conceivable kind of conveyor system, we are particularly heavily involved in distribution systems--many of which are dry grocery systems.

We pioneered the batch picking principle which today is the basis for many distribution systems. We are dedicated to furthering the state of the art, and we maintain a large research and development center for that purpose.

We believe we are professionals.

What is Human Engineering?

It is also known as human factors engineering--which I prefer--because it begins to describe the discipline which is aimed at making man as productive, functional, and safe as at all possible when interfacing with machines and environments.

It has very wide scope varying from something as dramatic as the design of a fighter aircraft cockpit--to the handles of a small pair of pliers to prevent destruction of a nerve in the palm of the hand as a result of the repeated pressure.

It covers measuring man's strength and endurance and the prediction of performance under given conditions. It is increasingly necessary in any design dealing with man/machine relationships.

Why Human Factors Engineering?

There are essentially three driving forces which are making this discipline more visible:

1. One is the ever present need to increase productivity.

2. Another consists of emerging social and anthropological trends which cannot be ignored.

3. The third is safety.

I will not attempt to set priorities on these forces. Depending on whom you are talking to, you can get into an argument over all nine possible rankings.

1. Ever Present Need to Increase Productivity

Unless you are lucky, you do not get the potential productivity increase with a casually designed piece of equipment. It rarely happens that way. A great deal

of attention must be paid to details to make sure man interfaces confortably and productively with the machine.

2. Emerging Social and Anthropological Trends

Social trends are becoming highly visible--which demand a more confortable environment. From a point of view of anthropology, it is dismaying to learn that the Biomechanical Laboratory at the University of Michigan has established that the average North American male no longer has the physical stamina to carry out certain arduous tasks. This was an ability we took for granted not so very long ago. Furthermore, it seems certain that the small percentage of the population still able to handle these jobs is steadily dwindling.

3. Safety

Finally, we have the question of safety. After what can be described as years of benign neglect, it is now very much the law of the land. It is increasingly dealing not only with the more obvious aspects of safety, such as getting caught in a chain, but also with areas to which little attention has been given in this context. (For example, lower back injuries caused by a poorly designed work station.) As anyone knows who has followed the trends of personal injury liability suits against equipment manufacturers, the cost of neglecting safety can be disastrous.

It would be pleasant to be able to state--without blushing--that human factors engineering has come about as a result of man's concern for man. The reality of it is that the discipline is increasingly needed if we are to achieve the mandatory improvements in productivity and safety.

What is Rapistan Doing About Human Factors Engineering?

I will give three examples of what we are doing. In a typical batch picking distribution system, there are two jobs which are quite unattractive and not as efficient as they could be.

One is picking the order which in a batch walk-pick system requires the man to walk down an aisle and pick cases from two levels of pallets. The lower level is not much of a problem, however, product on a full pallet on the upper level can be difficult to get to. Some of the imaginative ways the pickers use to bring the product within reach can cause significant product damage. In systems where the product is two pallets deep in the rack, the picker has the additional problem of having to remove an empty pallet and move it to the nearest empty pallet slot. Manually handling and stacking a 70-pound pallet up to 40 feet does not improve efficiency.

The second problem job is palletizing the completely random mixture of cartons which make up a customer's order on the shipping dock. It is somewhat like trying to do something constructive with a set of maliciously mismatched building blocks where you have practically no choice of which block you are going to use next. At this point in time, nothing much is being done--realistically--about the nature of the blocks. Until modularity in case sizes is introduced, the best solution is to improve the work station.

Both of these jobs can translate themselves into management problems. Very few people would choose these jobs given any reasonable alternatives. As a result, those who do take them are very rarely highly motivated. This can cause a very high turnover rate with the subsequent disruption of efficiency.

The next obvious question then is--why not automate the two functions?

It will eventually happen. In the meantime, however, there is an interesting problem. As clever as computers appear to be in some areas, they are no match for man's brain which is probably as close to a perfect real-time analog computer as we can get. When a man is picking cases or palletizing them, he is constantly making decisions without any apparent thought. He will handle damaged cases appropriately and will optimize by handling more than one case at a time where his judgment tells him it can be done. I don't want to belabor the point, but man's brain is still unique.

It is true there is an automated picking system available. However, I feel Rapistan has a certain solid credibility when we do not believe it is the answer. I say solid credibility since we installed the first system of this nature in the 50's and decided it was not the correct over-all solution.

Then what are we doing in these two areas?

In the picking area, we decided to put the man on an efficient picking vehicle. It moves the operator horizontally and vertically and enables him to locate himself in the best possible position for the next pick. He drives the car by means of efficient, but simple, controls which--since you have to protect man from man--are interlocked with safety floor mats.

He determines his next destination by looking at the topmost computer printed label in the automatic label dispenser mounted right in front of him. Since he now has ready access to both rack faces, the hit density goes up; reaching the second or even third pallet level is no longer a feat of advanced gymnastics.

The car enables us to do other things for the man. He no longer has to manhandle the empty pallets to the nearest empty pallet slot. He simply takes the empty pallets aboard the car where he stacks them on a conveyor section. When he gets to an empty pallet slot, he discharges the stack. While it does not completely do away with lifting, it reduces considerably the need for physical exertion and clearly saves time.

Since the car has electric power aboard, there are other things we can do. We can provide the operator optimum work light by mounting spot lights directly on the car. It enables him to pick with greater accuracy and increases his sense of wellbeing. There is an interesting and significant spin-off from the onboard lighting. Since the cars carry their own work lights, there is very little need for a high ambient light level. A large number of florescent tubes, their fixtures, installation and wiring, as well as the electrical energy they would use, present the potential for significant reductions in investment and in current consumption.

In freezers, we equip the cars with infrared heaters. This is a successful approach. In one such installation, our customer was able to get agreement from their union that the operators could spend longer periods in the freezer than was the case when they walk picked. This is an improvement in efficiency and in the environment.

We are currently testing a version of the car equipped with a small air-conditioner. This may sound absurd, however, it makes sense. Take the upper level in a rack directly below the roof

of a typical warehouse in--say Georgia--on a hot summer day. I will defy anyone to work in that environment for an hour and then tell me that his performance would not have improved if he could have been cooled off just a little.

The net result is that by introducing the picking car, we have removed a man from the bottom of the perceived social totem pole and turned him into a machine operator. We have removed the majority of the frustrations inherent in the job as it used to be. We have increased his productivity and accuracy and have reduced the potential for product damage. Improving the work environment translates itself into a reduced turnover problem.

In the future we intend to make further use of the cars by equipping them with devices capable of taking real time inventory of product on the system and of reporting shortages back to the central computer immediately.

There is a footnote to this which very much bears on how one should approach the man/machine relationship. We let the operator control his car, and in so doing, he will instinctively position it where it will be easier and therefore, faster for him to pick. Tests have been made to see what would happen if the computer positioned the car. The efficiency went down because the automatic controls can only take the car to fixed locations, and the operators interest level went down.

From this we can draw a very clear lesson: Man does not like to be an appendage to a machine. He functions best if he operates it.

When it comes to the palletizing station, I said earlier that we would have to improve the working conditions.

We have approached the solution by removing as many of the frustrations from the job as possible.

In this case, we are dealing with a system where pallets, as well as carts, are being used for shipping product from a dry grocery warehouse. Both sides of the station are equipped with air-operated bang boards which serve two purposes: one is to hold the pallet or cart firmly in place while being loaded; the second is to give the operator a reference surface against which to place the product as he builds the load. This relieves him of having to be concerned with checking that he is getting a straight side on the back of the load. Without a bang board, he would almost have to walk around the pallet to check. The remaining three sides are easily checked visually.

We have placed the operator on a lift to let him choose the work height most convenient to him. In this particular case, he touches a large mushroom-head button with his knee which will raise him up in increments of 12". There is no need for him to hold the button, and his work is therefore not interrupted.

Anyone who has ever tried to build a reasonably stable pallet load made up of a random selection of the cases to be found in a typical grocery warehouse will probably agree that it slows you down considerably if you have to check all four sides repeatedly. It is also very frustrating to build the load as it grows towards seven feet in height unless you can see over the top. There really is no way of knowing where a given case might fit, and the result is that the last cases are frequently thrown on top which does not improve load stability nor reduce product damage.

In trying to build a pallet load out of random size cartons, it is important that you have as many to choose from as possible. It is quite common that the next available item simply will not fit into the niche which needs to be filled before you can go the next tier. To improve this problem, a runout conveyor is located behind the operator. If the next case does not fit, it is allowed to move along this unit from where it will be selected later when a suitable spot is found for it. When the pallet has been built up, the bang board is retracted and the pallet moved to the down-stream position where it is again clamped to prevent it from running away while waiting to be picked up. The next empty pallet is readily rolled into position and clamped to allow the cycle to start again.

Since the switch from pallets to carts is made only a few times a day, moving the gravity run-out from side to side is left as a simple manual side action.

In building a pallet load of this type, the operator constantly has to make decisions as to where the next item should go. This makes a steady work rhythm difficult to achieve. If product simply kept arriving at the pick-up plate, there would inevitably be times when the operator would not be ready to pick the next case up before it had been pushed onto the floor by another. This would not only lead to product damage, but, in my opinion, would frustrate the operator to the point where he would frequently shut the infeed conveyor down while handling a difficult case; the result would be loss of productivity.

To avoid this we have designed the pick-up plate so that when one carton has arrived at the pick-up position, one more case is allowed to come in behind it, after which the unit shuts down. It restarts as soon as the first case has been removed. We believe the operator is more comfortable, and, therefore, more productive with this approach. There is disagreement on this point. Some people hold the firm opinion that machines should pace man to give a high degree of productivity. There is, however, increasing evidence from a variety of industries that modern man does not respond well to this.

It is legitimate at this point to ask what is so unique about this simple work station?

Nothing, really, except that this is another area where man has so far largely been forgotten or at least taken for granted. By paying attention to his needs, his efficiency goes up and better loads are produced, while at the same time, making the operator more comfortable and safer.

This third example is simple but amply illustrates the benign neglect with which this whole subject has been treated.

The conveyor side frame made as a channel with the flanges turned out has been standard throughout the conveyor industry since the inception of metal frame conveyors. It never really seems to have occurred to anyone that, in many cases, people are working up against the units and frequently have to lean against them when removing or depositing loads. The two flanges projecting towards the worker do not make a comfortable support surface. When it finally did occur to us, we redesigned the side member so that a flat clean surface is presented to the operator. This makes a far more comfortable support surface. This side frame will shortly be standard in our equipment.

The example is typical in that it shows that, in many cases, human engineering consists of simple changes requiring considerable attention to detail.

Where is Rapistan Going from Here?

As originally stated, we believe human factors engineering is a discipline which will become more and more important. With this in mind, we recognize that our efforts to date, while sincere, nevertheless have been carried out by engineers without any specific knowledge of this surprisingly specialized discipline.

We, therefore, intend to begin to bring into the company people who are educationally qualified to meet the challenges in human factors engineering which will increasingly be coming at us in the future.

While it is certainly popular, I do not believe it is practical to talk of automating everything. We are, however, going to have to mechanize a great many functions to achieve the necessary productivity increase.

To try to do this while ignoring human factors engineering amounts to a refusal to accept the facts of life.