PRODUCTIVITY FOR THE FUTURE: ENERGY

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Outlines and discusses the steps that should be taken to insure that adequate energy will be available to power whatever food industry system might evolve in the future.

Introduction

As we are experiencing an energy crisis, "two figure inflation", material shortages, productivity declines and a potential food shortage, it is quite appropriate that we spend a portion of our time considering ways to get ourselves out of this mess.

The objective of this discussion period is to identify the potential for productivity increases in the food industry system through the development or application of new technology. More specifically, my assignment is to look at energy technology and to identify areas where changes in the technology can affect productivity in the food industry system.

Two definitions are necessary before proceeding further. First, the food industry--with its four major segments production, processing, distribution and consumption--will be considered as a total system. If energy utilization efficiency is to be our criteria, we must measure the total energy used, system wide, against the food consumed to quantify the relative efficiency of our delivery system. Energy spent in our major segment may mean a savings in other segments and hence a total energy savings. Conversely, energy saving in one segment may cause more than proportionate energy use in another segment and a greater total energy bill for the item.

Secondly, energy technologies will be discussed in terms of the basic form in which the energy is utilized e.g,, oil, natural gas, coal, etc. Electricity and steam are examples of secondary forms of energy because basic energy forms must be converted into these other forms.

Our procedure for addressing this subject will be to briefly discuss the present food industry system and energy technologies with an eye toward possible increases in energy productivity within the current system. Then we will look at alternative energy technologies and what effect they might have on the system.

One more introductory comment is necessary. Data on energy consumption and utilization throughout the food industry system is very scarce. This is one resource that we have been fortunate enough to have not had to worry about in the past. Thus there are vast areas of uncertainty when one tries to look at energy productivity for a major food industry segment, let alone the total system.

Present Situation

The current food industry system is essentially powered by oil, natural gas and coal. These fuels, along with small amounts of atomic energy and hydropower, are either utilized directly, refined into other products for direct use or

converted into steam, hot water or electricity for use. The major systems characteristics pertinent to this discussion are speed, flexibility and mobility. The current food industry system is relatively flexible. More importantly, it must move perishable or processed (high energy use) items over great distances with varying degrees of haste.

The major energy technology characteristics pertinent here are availability, flexibility, mobility and cost. We have had plenty of low cost energy that could be used in many ways. Above all it was mobile. However, the events of the past year have removed the low cost characteristic and raised serious questions regarding the availability of these energy forms. They are, however, still flexible and mobile.

One very important point here is that there is no alternative energy technology available for large scale application in the short run to relieve us from the dilemma of increasing rates of utilizing a fixed nonrenewable resource, decreasing reserves and spiraling energy prices. Let us hasten to add that long run viable alternative energy sources do exist and will be discussed later in this paper.

Given this situation and our ever increasing demand for food, logic would dictate that we ask: Can we increase the energy productivity of our present food industry system? The answer is yes; we can and we are. Examples in production are minimum tillage systems, improved varieties and fertilizers and processing of animal wastes to get methane gas. In processing, bulk preservation techniques and using lower grades of fuel to heat water are examples. Distribution examples are larger units for more efficient handling, utilizing refrigeration exhaust heat to heat buildings and better route efficiency in product delivery. In consumption, better utilization of stoves and ovens, care in hot water utilization and better use of cold and frozen storage units are examples.

The more crucial question is: Can we increase energy efficiency in the food industry system enough to get use through the transitory period during which alternative energy forms are being perfected? The answer to this question is that due to a number of imponderables we don't know. Some of these problems are:

1. How much fossil fuel will be available by U.S. consumption?

2. What percentage will go to the food industry system?

3. What will be the national energy policy for alternative energy sources?

4. How long will it be before viable alternative energy technologies are mass produced to replace the fossil fuels?

5. Who's in charge of our national energy policies and programs?

How much can we tighten up the energy productivity of the present food industry system? The answer, at this point, must be a very unscientific "as much as we have to!"

One could fairly draw the analogy to a pro football team's dependence upon a 38 year old quarterback. He has served us well. We don't know precisely how much longer he can last. We want to maximize the use of his talent's over his remaining years. There is a risk that he may break down at any time. Finally, we must be training his successor.

The Future

As we look through the list of potential successors for oil and natural gas at energy sources to power the food industry system, let us analyze each energy technology in terms of what changes

it might force upon the system. In order to give us some chronological perspective, let us use short term (1985), medium term (2000), long term (2050) as a time frame.

Short Term

Between now and 1985, the energy technologies available to us in sufficient quantity to make a significant impact upon the energy situation are coal and nuclear fission. Synthetic fuels from coal and oil from oil shale may help a little. However, questionable energy conversion efficiencies and environmental impact will limit the use of these fuels.

Neither coal or nuclear fission are new energy technologies. The issue is to solve the institutional, political and environmental problems connected with bringing more of these two fuels on steam to replace the natural gas and oil that now power our electric generators.

If we can successfully replace a significant portion of gas and oil now used to power electric generators with coal and nuclear fission, the situation will be one of either no change to the basic food industry system or an improvement. No changes in the source that adequate petroleum based fuels will be available for food industry use. An improvement in the sense that the potential problems arising from another oil import cut off would be lessened.

However, if we are not successful in making this substitution, we face increasing pressure upon our liquid fuel supplies and a real threat to the adequate functioning of our food industry system.

Medium Term

By 2000 A.D. we have the opportunity to add geothermal, tidal and wind energy to our arsenal of energy technologies to power the food industry system. The problems with these energy sources are that they are limited geographically and in terms of magnitude to make significant total impact on our energy needs.

The one energy technology that can make a significant impact upon energy needs is solar energy. Like wind, tidal and geothermal energy, solar energy is clean and renewable. Unlike the other three, it is essentially limitless. Technical problems in concentration of the sun's diffuse rays are the stumbling blocks which must be overcome.

These four energy technologies plus coal and nuclear energy can easily satisfy our fixed place power needs. The real stickler in this transitory period is: Where does our mobile power come from? Experts warn of depletion of our oil supplies by or before 2000 A.D. Given our state of technology, with oil goes our mobility, electricity storage technology, barring breakthroughs, shows no promise of adequate mobile electric power to move our food industries goods or do production work. We have nuclear fission powered ocean going vessels. But the application of this technology to ground transportation does not appear feasible during this period.

What are we trying to say? Simply this. Barring significant technological breakthroughs, the today's food industry system will experience a serious threat to its mobility and flexibility during this medium range period due to changing energy technology. The principal areas of greatest concern are: 1) Speed of movement of goods; 2) Flexibility in movement of goods; 3) Handling of perishable goods; and 4) General mobility.

Long Term

By 2050 A.D. we are told that a significant amount of energy from hydrogen fusion will be available for us. This energy form is clean, essentially limitless in supply and mobile. It will be available in a liquid form so something similar to our current distribution

system could be utilized. It can be burned in a version of an internal combustion engine this giving us back our mobility.

An Ideal Solution

What is the best of all worlds? Extend the fossil fuel age to meet the hydrogen age, by means of utilizing more coal and atomic fission and employing the renewable (solar, wind, tidal and geothermal) with a massive research and development effort to speed up hydrogen fusion. A pipe dream? Who knows. Many a pipe dream has become a reality. What we have to know is how to get there from here.

A Positive Program

What can be done to insure adequate energy to power whatever food industry system might evolve in the future? Some steps are:

1. Develop and practice an energy consciousness.

2. Insist upon a national energy policy in the public interest.

3. Support research and development of alternative energy sources based upon well thought-out priorities.

4. Consider the food industry as a total system when looking at energy problems.

Can our energy problem be solved? Yes!! But George won't do it. You have to!!