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Infinite source

In the engineering science, the fundamental textbooks have traditionally used the technique of reducing seemingly complex problems to a manageable level by removing all contributing parameters possible. Then, within the simplified scope, the solutions to the initial complex problem could commence one elementary step at a time. Examples of some such simplifications are free body diagrams, the black box concept, definitions of boundaries, and the concept of *infinite source-infinite sink.*

Unfortunately, in some disciplines of engineering, the purpose of the simplification has been lost, and the problem never returned to the initial integrated concept. (It might be mentioned here that the same criticism applies to many disciplines of the social sciences.) In the field of elementary thermodynamics, the concept of infinite source-infinite sink has been employed for decades as a very useful tool. However, as the engineering students entered the community of designers of energy conversion systems, the only areas in which the finite nature of any problem were reintroduced was that of economics or immediate availability.

The proposition is then presented that the lack of recognition of these sources and sinks as being finite by natural laws has been a significant contribution to two major socio-technological problems of recent years: environmental degradation and energy excesses.

Sun is only infinite source

It is interesting to note the overwhelming attention given by the scientific community and the public sector to the perpetuation of the infinite source concept in looking to the sun for the long-range solutions to energy problems. For, in reality, the sun is the only infinite source of energy available to mankind. The reasoning is, then, that if we simply develop the technology of converting the thermal solar energy into whatever form we desire (shaft, electrical, heat, or heat removal), we can proceed with business as usual. The fact is that the flux density of the solar energy is so low that the capital burden of collecting, storing, converting the form, and transmitting the energy obtained from our infinite source is so great that business as usual is not possible if this is the sole source available.

Much attention, primarily in government-supported research and development, has been directed to such schemes as the solar furnace (capable of generating fluids at a temperature level compatible with the state of the art methods for producing shaft power), oceanographic thermal level power plants, satellite converters, and collection by photosynthesis to grow gigantic forests for ultimate conversion to methanol. If one carefully scrutinizes the capital and labor, for both investment and maintenance, required to provide an energy unit equivalent to a single gallon of gasoline, or energy to "power" a home with the amount of electricity American homes consume today, it is seen immediately that, when this becomes our only refuge, it will not be "business as usual."

Finite source must be found

The purpose of addressing this issue is not to discourage the ever-important consideration of looking to the infinite source as an eventual means of providing some of our energy requirements, if not all; but rather to emphasize that the more immediate task to be addressed is the "finite source."

As the engineering, architectural, business,

and academic communities move aggressively in the direction of the finite source, our society will revel in change. The challenge to the architect to produce an esthetically attractive building that is functionally successful and utilizes the sun and environment in such a way as to minimize energy required for indoor comfort; the challenge to the engineer to provide the product requirements for such a building or for a vehicle with a system that is both capital effective and has minimal process losses; the challenge to the entrepreneur to develop and market products for a growing energy-conscious public; the challenge to educators to lead the way in this new sociotechnological era, probably the greatest challenge in the field of education since higher level education was made available to all who desired it; and the reward to homeowners who can maintain a standard of living not hooked on consumption of increasing amounts of energy; all will result from the hopeful recognition of the "finite source."

The point is not too subtle: this "finite source" concept is simply another approach to the almost worn-out topic of energy conservation. The need for the alternate approach is mandated by the lack of success of less fundamental avenues taken heretofore.

In the ensuing years, the accomplishment of the goals of the finite source concept will necessarily cause meaningful shifts in current economic and business institutions. There is little doubt that the revenue growth rate of energy suppliers will suffer, perhaps even assume a downward trend. This will require skilled management on the part of these institutions, management which must turn to development of infinite source energy *where it is most economically adaptable*, effective utilization of the finite source, and other such diversifications. Logically, an infinite reliance on a finite source is inevitably short-lived.

In summary, if the finite source thrust is successful, an increasing dependence upon the infinite source will become ever more practical. If only there were such a patent solution to the infinite sink problem!