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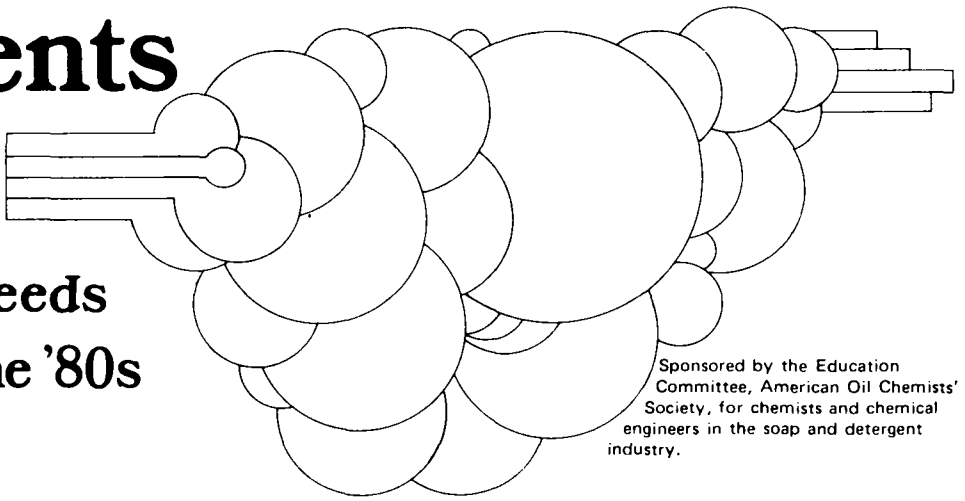

Sponsored by the Education Committee, American Oil Chemists' Society, for chemists and chemical engineers in the soap and detergent industry.

September 14-17, 1980
Hershey Resort & Country Club
Hershey, Pennsylvania

Session 4

Synectics

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ABSTRACT

Group problem solving techniques can be useful even if they are rarely used with a group. The principles involved can help identify problems earlier and lessen any tendency to put off solving them; and one becomes willing to tackle more difficult, complex problems. In the corporate environment, these techniques are often used as communication aids among groups in place of more traditional meetings. They can be much more effective for problem interface situations where groups are in conflict, or else just talk a different language. Such techniques are described in this paper.

USEFUL PROBLEM SOLVING TECHNIQUES

The four fundamental steps involved in the process of problem solving can be listed in the following approximate order: 1—recognition of the problem; 2—analysis of the problem or gathering of information; 3—unconscious processing; 4—synthesis/new ordering/redifinition/possible solutions.

Most techniques used in problem solving or invention concentrate on either (a) systematizing the analysis and information gathering step or (b) stimulating unconscious processing. These techniques originated from two main sources: the study of individuals inventing or problem solving (either directly or by case study/literature) and the study of groups engaged in problem solving. Group techniques generally also employ additional rules to help reduce the "people" problems involved and to increase useful behavior.

The factors involved in people problems include excessive competition, negativism, domination, premature judgment or non-listening. An increase in useful behavior may develop from building on ideas of others, giving credit/encouragement and preserving individual points of view. These techniques are frequently employed in place of traditional meetings to engender group cooperation among diverse groups, groups that work together infrequently, or groups in which conflict is likely to interfere with mutual problem solving.

Most of the literature on problem solving aids and techniques concentrates on usage by groups. However, this paper will focus on how these techniques can be used by the individual for problem solving and how appreciation of the flow of problem solving can also help.

The following plausible problem is selected as an illustration of this technique: stabilizing a liquid product containing chlorine bleach. A few of the factors which should be considered are: pH, ionic strength, purity of raw materials, purity of the chlorine source, and heat/shear used in processing.

One useful technique is the "How to," devised by Synectics, Inc., a company which specializes in problem solving services. An example from the Synectics process is:

How to have chlorine purify itself?
How to coat chlorine in armor?
How to find a more stable chlorine?
How to have chlorine touch only the clean side of other raw materials?
How to polymerize chlorine?
How to obtain metastable chlorine complexes?
How to generate bleach only when product is used?
How to form chlorine that never gets wet?
How to form a dry liquid?
How to screen for purity quickly and cheaply?

How to have a safe high pH system?
How to coat all the other ingredients?
How to minimize surface area of other raw materials?
How to find materials that thicken in chlorine?
How to hide chlorine in a polymer?
How to compress degradation profile of product to a day for quality control?
How to sponge up chlorine?

The "How to" is a very flexible tool. It is based on the evocative nature of asking questions. It should be noticed that this is a very loose technique—some questions are specific, some general, some abstract and some are concrete. They range all over the problem. Those familiar with brainstorming will notice a resemblance between the two. Stating these aspects in question format makes it easier to avoid premature judgment. When using this technique on one's own, it is useful to list as many as possible in a completely uncritical frame of mind. Then one should stop and do a rough classification. This often discloses the inherent structure of the problem—the individual parts and how they fit together—if they do. At times, one may find that problems which are really rather separate have become intertwined. The rules governing "How to" statements are the same as those for brainstorming: when one considers that quantity breeds quality, as many questions as possible should be raised. No criticism should be applied during the process. A distinction should be made between judgment and criticism; judgment is never entirely absent. But, by withholding the explicit statement and an emphasis of negative points, less plausible possibilities are preserved.

Synectics has evolved another approach to the judgment/criticism question called the Itemized Response. It consists of listing both the positive and negative points: positives are listed first and negatives are converted to "How to" statements. The idea of an encapsulated hypochlorite will be arbitrarily selected for a hypothetical product.

The positive responses would deal with (a) more latitude on composition of the liquid, (b) a lack of concern about purity of other raw materials, (c) a larger choice of colorants and perfumes, or (d) a system to control the release and thus eliminate damage or spotting of sensitive materials or surfaces. Negative responses, on the other hand, would be concerned with (a) how to encapsulate cheaply, (b) how to ensure a 100% seal, (c) how to suspend capsules uniformly, (d) how to reap full benefit from the chlorine, and (e) how to encapsulate without special equipment.

This procedure is designed to obtain maximal mileage from each possibility. It is also quite beneficial when one is working alone. Quite often, one considers an idea and experiences vague feelings of like and dislike, making it difficult or uncomfortable to proceed. Doing an Itemized Response can help get one moving again.

Those aspects of problem solving which have been mentioned so far include (a) deferring judgment, (b) preserving differing points of view, (c) replacing judgments with questions, (d) writing things down/reorganizing them, and (e) quantity breeds quality. So far, the systematic/logical approaches have been briefly described. They are not specifically designed to maximize newness. For that, techniques are needed that stimulate unconscious processing. To illustrate these, one can look at some of the analogy games used by Synectics, Inc. The basic aim of these exercises is to encourage unusual connections of the sort the unconscious mind might make in the absence of that reliance on more direct similarities that the conscious, logical side of one's mind makes.

The first technique is called Evocative Examples. In this, one tries to alloy parts of the problem to material that has no obvious direct relationship to the problem; some examples of this are (a) chlorine from the world of flowers, (b) stability from the world of insects, (c) encapsulation from the world of music, and (d) purity from the world of geology. Now examine one of these: chlorine from the world of flowers could imply light (color loss/bleaching), thorns (unpleasantness, causes holes), poison ivy (corrosive), chlorophyll (chlorine compound), insecticides (halogenated hydrocarbons), ethylene oxide (gas that causes color change in fruits and vegetables).

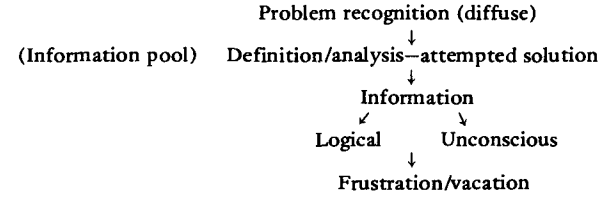
Then look at a second round—poison ivy from the world of machinery could imply Edsel, printing press, bearing, knurling, blister pak. About now, one can find oneself losing track of the starting point; that's good. The connections, while temporarily submerged, are still active on a subconscious level.

Attribute listing is another technique. A list of attributes of the hypothetical product would include (a) chlorine odor, (b) liquid, (c) contains abrasive, (d) loses chlorine activity over time, (e) thick, and (f) contains detergent.

One should pick an attribute and ask what it would mean to modify it. Assume that it contains an abrasive. Must it? Would it decay more slowly without it? Why? Impurities? Surface area? Can one get a purer abrasive? Preoxidized? Can one bake it in air? Prebleach it? Only use the larger particle sizes? Separate the chlorine source from the abrasive? Get an abrasive chlorine source? Do with a solvent instead? Thus, one can brainstorm each attribute. Let us use this material to illustrate another Synectics exercise: essential paradox. Here, one makes up two-word paradoxical descriptions. For instance, for the hypothetical cleaning product: immaculate decay; liquid hardness; volatile hardness; abrasive fragility; and obvious invisibility.

How does one use this sort of material? It is obviously not like using fragments of information. This is difficult to explain because it is experiential. When working alone, it is sometimes sufficient to generate such evocative material and some ideas will follow. This lies in the subliminal connections made while doing the exercises, not in trying to use the material directly. When this is not the case, one tries to "daydream" over connections. Sometimes, little comes to mind. It takes a bit of faith. Even if nothing occurs to one directly, returning to direct logical approaches after such a respite is often more productive because the scope of one's thinking and one's approaches has been broadened.

Let us now address another aspect entirely—the influence of the usual flow of problem solving:



When one recognizes a problem, and often, prior to any attempt at formal definition, one's first instincts are to try to solve it with whatever information is at hand. If that doesn't work, more information is sought and one begins to analyze more thoroughly and try again. One searches both logically (literature, colleagues, memory, previous experience) and unconsciously. What is the difference between the so-called logical and unconscious search? Without attempting to be too precise, the logical search is a search for similarity, sequence, or pattern: A matches B, follows B, causes B, is found with B. Unconscious processing appears to be primarily associative. An aspect of similarity is still involved but it is less obvious, less direct. As soon as one obtains more information, one tries to solve the

problem again. We cycle back and forth until the problem is solved or stop in frustration, at least temporarily. Conscious processing stops but unconscious processing often does not, especially if the previous effort has been intense. Sometimes the result is the sudden flash to a fully formed solution. This sort of thing has often been documented in the stories of famous inventors or inventions. At other times, one finds that one returns to the problem with new thoughts, even though no conscious effort has been made in the interim period. What can one glean by examining this characteristic flow? For one thing, realizing a need for some balance between logical and associative thinking prompts one to reconsider them. Another important point is the need for intensity. This will be illustrated with an example. A group in the speculative developments area was given an assignment to devise some new margarine ideas for the foods division of a large company. This was not greeted with great enthusiasm at the time. As can be imagined, this was somewhat of a well plowed field. At the time, it was decided to experiment with the intensity variable and the following was carried out: previous documents, including old ideas, market research studies, technical and processing literature and business analyses/market structure studies were gathered.

Each day the group gathered in one room and read the documents which ran to several thousand pages. Each one worked alone reading, scanning and taking notes. When one finished the pile, s/he went back to the beginning and started again. Nothing else was done during this time. Occasionally, notes were compared, however, there was very little to compare during the first few days. Incidentally, none of the group had any previous experience with margarines except for previous ideation sessions. This is, of course, a very frustrating exercise. It lasted two weeks. Not all of the group could stick to it throughout, despite good intentions. It wasn't long before their only thoughts were about margarine. After about three days, a trickle of ideas began. Best productivity in terms of novelty/quality was at about one week, after which much attention was devoted to polishing ideas that each liked. In the end, the group was quite satisfied. The volume of finished ideas was not spectacular (35, of which perhaps half had elements of real newness). This technique is recommended for important problems, i.e., problems that one feels are worth a special effort. It is a unique, if not entirely pleasant, experience. Incidentally, the previously illustrated analogy exercises come in handy here. Staying entirely in the logical mode for such a sustained period on one problem could be quite impossible for some. Alternating between examination of the material and associative exercises allows one to keep at the problem considerably longer and yet contributes to building intensity in a relatively short time.

The following four points are worth remembering: 1—writing/reorganizing; 2—replacing judgments with questions; 3—alternating logical and associative thinking; 4—value of intensity.

Obviously, none of these systems is a magic answer. That these techniques can help takes some faith—at least until one has tried them long enough to feel comfortable with them. They do help. Not all of them will suit each person. A number of these have been the subject of government and university studies. Definite and lasting benefits have been demonstrated. Hopefully, some may be of use to the reader.

✂Gearing Surfactants for Use in Consumer Products

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ABSTRACT

Surfactants are created for consumer products because the wants and needs of consumers and their suppliers are thoroughly analyzed and judged to provide a business opportunity that is in line with the strategic direction of a surfactant supplier. Entering the surfactant market for a consumer product is based on six key steps which are (1) market definition and target selection, (2) definition of consumer and supplier wants and needs within the target market, (3) determining the feasibility of meeting these wants and needs and making a go/no go decision, (4) developing and fine tuning the product, (5) a market introduction program and (6) continued support once the product is successfully commercial. This paper discusses each of these steps.

DIRECTION

The starting point for a supplier in developing a surfactant for consumer products is the establishment of clear, concise and fully understood directions. The supplier must carefully sort out his strengths and weaknesses and clearly define objectives and strategies before even looking for product opportunities.

In this stage-setting process, the surfactant supplier must make some key decisions: does he intend to (a) market specialty or commodity products? (b) move raw material? (c) use and/or fill up an existing production facility? (d) capitalize on technical or sales strengths? (e) make effective use of his capabilities in distribution? or (f) provide synergism with other products in his company's portfolio?

In the commodity surfactant business, suppliers generally aim at the consumer product market in order to realize some fairly basic objectives, such as (a) moving large volumes of raw materials such as ethylene, benzene, paraffins or natural oils; (b) keeping a plant, or a production unit busy; or (c) capitalizing on one-up technology such as continuous sulfation/sulfonation or a hydrophobe/hydrophile process.

Two or three years are needed to develop a commodity surfactant and move it to a base position from which sizable growth will compound over a period of 20 to 40 years. Commodity surfactants usually reach sales peaks of 200 million lb/year and more as they are marketed into such large-volume consumer products as laundry powders and liquids, liquid dishwashing detergents, soaps and shampoos.

Linear alcohol ethoxylates and α-olefin sulfonates are two current examples of commodity-oriented surfactants. The ethoxylates, after an initial push in 1965, grew at an annual rate of 10% to a total of more than 400 million lb