

**R&D PROJECT BRAINSTORMING**

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## R&D PROJECT BRAINSTORMING

### INTRODUCTION

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My name is Tom Timbario and I am with Mueller Associates, Inc., a consulting engineering firm in the Baltimore-Washington area. Mueller's association with synthetic fuels, alternative fuels, in general, and transportation energy conservation projects began 5 or 6 years ago when many of these programs were a part of the EPA. Currently, we provide engineering and technical services to Gene Ecklund's Alternative Fuels Utilization Program.

In thinking about what we might try to do tonight for the workshop, I tried to think of a phrase or word that would serve as a theme. The first thing that came to my mind was "a can of worms." I didn't think that would be appropriate, so I thought about it a little bit longer. The second thing that came to my mind was *value*. In this respect, I thought of the *value* that synthetic fuels can provide in allowing our nation to get away from the use of petroleum. Since I am an engineer by trade, the two words *value* and *engineering* seemed to fall together. It is not difficult to see how it might have a relationship to this workshop since brainstorming techniques are very closely associated with value engineering concepts. *Value engineering* is defined as "the accomplishment of a reliable function at the lowest possible cost." In other words, it is good value. So, what I have tried to do is to stretch the meaning of the *cost* to be something a little bit more than we might normally consider. That is, *the cost to society, and the cost of system change requirements* in addition to the increase in price which we forecast for typical synfuels.

The best implementation of value engineering concepts is through team action and creative thinking. I submit that we have both of them here tonight.

In this workshop, what we are going to do is concentrate on the second key step in the application of value engineering principles. The second key step is called *speculating* which, in this case, is called *brainstorming*.

We have already completed the first step earlier today, and that is information gathering.

What are the rules for brainstorming? They are:

- (1) Criticism is ruled out, no judgment is to be attached to any idea at this point.
- (2) There is to be complete freedom of thought, and that freedom of thought is welcomed. The wilder the idea, the better it is because it is easier to tame something down than it is to think something up.
- (3) Quantity is essential. We need a lot of participation and a lot of ideas. The more ideas, the more potential winners.
- (4) Combine, modify, improve, and generate upon other ideas, and spin-off from other things that have been presented.

What we would hope to gain from tonight's activity is a listing of ideas, projects, and activities. We can then classify them according to Ralph Fleming's matrixes that he described earlier this morning.

Now, to set the stage for tonight's creativity, there are a couple of things that resulted from today's session that I think are worth repeating and serve as a good starting point. Those things are:

- (1) There is a definite need for the *systems approach* to attacking the overall synfuels problem. As a suggestion I would offer that we define this systems approach.
- (2) How do we go about implementing the RDT&E according to the systems approach?
- (3) There is a need to initiate synfuels work. There was a similar conference on alcohol fuels this past summer in Santa Clara, California. When it was over, a certain mood of frustration developed based on the feeling that "we need to get on with it, but for

some reason we can't. We can't get to the right people; we don't have the tools to operate." Today's suggestion of forming a committee or working group that would start to carry the word back to those people who need it, might be a convenient place to start.

Before I let you go, I want you to keep in mind the objective that Ralph Fleming and Gene Ecklund established this entire conference. It is to bring together the country's experts on the production and utilization of transportation fuels de-

rived from coal and oil shale in order to assess the state of the art. Part of that was done today, and it will continue tomorrow. We also have to determine what R&D programs are needed to effect the transition from today's petroleum-based fuels to synfuels, as they are utilized for transportation purposes. We should try to keep in mind that while the production aspects are very important, obviously relevant and are a portion of the overall systems approach, the main purpose is to determine *what R&D is needed with respect to finished fuel formulations.*

## OPEN DISCUSSION

### Speaker 1:

I have in mind a comment that is a continuation from this afternoon's session. A gentleman suggested that we organize or form a group to bring attention to the proper congressional authorities of the problems in synfuels. I would like to point out that perhaps some ground could be gained here by working through the existing technical societies. ASME, for one, has a Washington office, and it actually has a full-time staff in order to interface with the government. SAE has a government relations committee. They have an 800 number so that they can be on tap to talk with various congressional staff members and the congressmen themselves at times. I know that the civil engineers, IEEE, and others have this kind of relationship with Washington. Now this might not replace the intent of forming a separate group, but it is there and it is in existence, and it might be a way to get started fairly quickly while you were formulating such a group.

### T.J. Timbario:

I think that's a good suggestion for consideration. I am going to spin off from that and suggest that another alternative might be to work through the Engineering Societies' Committee on Energy, ESCO, as it is better known. It works directly with DOE and is supported with DOE funds. I don't know if there might be any conflict of interest there, but certainly these people represent all of the major engineering societies and are very highly regarded in energy circles.

### Speaker 2:

There are enough people already knocking at the door and nobody believes them. None of the societies has any credibility now, and forming another one is not going to make it any more credible than the rest. The people don't believe you.

The only people you can influence are the general public. You have to convince Archie Bunker that there is a problem. Until you do that, there isn't any solution. Forming more and more societies isn't going to achieve anything.

I go and talk to the Lions Club and the Rotary Club and the Womens Club and anybody else who will let me talk to them. I tell them that I am English and I don't live here, but I came to work here. I brought my family here, and they think that if he is mad enough to do this, he must be telling us something. So they listen to me. I think that's the only solution to the problem. The technical people, the people who really understand, have got to talk to people that don't understand. At Santa Clara, I was talking to Scott Sklar, and we said what is the problem? How do you convince the American people there is an energy problem that has to be solved?

Last winter, we had a coal strike; we had a cold winter. Nobody was frozen to death, hardly any people had to be bothered. Why? Because the energy companies managed to get the energy there, and the government managed to do the job that they should do. They didn't tell anybody that they had done it, but somehow they managed to do it.

So, we lack credibility because we do the things without anybody knowing that we have done it. How do you persuade the people there is an energy problem when every time there is a crunch, you manage to solve the problem?

So, it's suggested that we operate and try to work through service organizations.

### Speaker 3:

I agree that we have to get to the people. I just wonder if the people wouldn't listen to committees working through popular writers, maybe even some science-fiction writers who could persuade the public. Let's face it, I think that we (at this conference) are scared, and we are *supposed*

to know what is going to happen, but why not get them (public) to the point that they are scared enough to call the congressmen and get the congressmen on the horn too.

So, it's suggested that we try to operate through the media as well as the government agencies and professional societies.

**Speaker 4:**

Well, back to that point. You start off with the systems approach, definition, and implementation. Late this afternoon, Commander Lukens set forth a real challenge for this group when he predicted a transitional situation rather than building new plants dedicated to new product streams and that maybe there was a transitional way to get at a partial build-up of new products. That would only happen through people that are here. It might be interesting to see from definition and implementation how that might happen.

We should try to work with facilities we have in place, such as existing refineries, existing pipeline streams, and so forth, and just try to build from that.

**Speaker 5:**

One of the subjects discussed earlier was what can the specifications be? What should our goal be for that kind of a spec? I think that the goal should be to try to make available a vast new source of fuels that would extend this middle distillate range and be the same spec as we have now. That should be the goal, not to make a sloppy fuel that would create all those extra difficulties. We have to realize that the automotive industry can figure out a combustion system that will work for almost any fuel, and, if there is a large supply of it, they can make all the necessary heaters, vaporizers, burners, and stuff and make it work.

So, the whole subject should center around the questions of: shall the goal be just to make a wide batch of fuel available or zero in on a vast supply of new fuel that would be the kind that would run in all kinds of engines such as turbines, diesels, gasoline, etc. This puts the burden on the fuel fabricators, formula makers, and so on. They have to manufacture that kind of fuel that we can

use in the vast fleet of vehicles and engines that are out there.

**Speaker 6:**

I think Speaker 2 had the place to start. I'm involved in this same kind of thing. As a matter of fact, the way I got to San Antonio was to go from Poughkeepsie, New York up to Rochester to talk to the local chapter of the ASHVE (The American Society of Heating and Ventilating Engineers). I do this on a circuit, like a lot of you do, too.

The one problem that we face is that for a while after the embargo, everybody was talking energy crisis and unfortunately a lot of people (who technically should know better) still talk energy crisis. People know there is no energy crisis right now. There is crude oil because of the North Sea and because of the Atlantic Slope. There is a crude oil excess and actually, we are tying up tankers at the present time. People had better understand that as far as crude availabilities are concerned, you only have to look a few years down the road before we will have a problem. If people accept that we have an energy problem, then we have to begin to talk about the conflicting things that we are involved in. Emissions are important, and air quality is important. But, we keep pushing and pulling. The fuel economy standards are pushing in one direction; the diesel is coming in to solve it. Particulates are going to throw the diesel out. It's a real hodgepodge.

Basically, what has to be done is that we have to get to the point where we are not talking about another committee. Again I agree with the point brought up. SAE has committees, API has committees, and ASTM has committees. These are not at a level where they can provide anything but technical information. Somebody has to provide direction.

I believe that, just as the water problem was discussed at a high level by invitation from Vice-President Rockefeller and the air quality problem was discussed in a similar forum, we have to get the energy and the engine people together at a decision level so that they can actually have recognition in the Congress. What is being done by the government in regulations now is hurting both of them. It is hurting all of us.

There are two aspects of this. One is the

grass roots thing. This has to be done. Anybody that wants the information can get it from the engine people and the oil companies. Go out and talk in your local community and spread that word. Somehow we have to get decision makers of the automotive industry, the transportation industry, and the oil companies to get together and say that 10 years from now we will have a problem, and we have to address it now.

Let's get off this kick that synthetic fuels should go into transportation because that is the only definable DOE program going. That is the worst place to start a new fuel. Let's get it into stationary powerplants, and we can make the transition to transportation. But stationary powerplants can sit there and burn slurry coal and alcohol if you will give them the time to do it. It is a lot better than changing over a transportation fleet.

**Speaker 7:**

I would like to pick up a little bit on what Speaker 6 had to say. One thing we certainly can try to do is to address this proposition of getting the end use community together from the technical point of view. This proposition is, for example, having somebody in the government as a group who can interface with you in industry who have to address all of these needs.

We also got into the situation of mentioning transition scenarios. We have long thought that we really ought to do something in this area because what bothers most of us is that it isn't what we might do *tomorrow* that gives us the problem, it is how that links to what might *ultimately* happen. We don't like the idea of going off with alcohol because we don't know if alcohols are going to be the ultimate fuel. We don't like to go in this direction because you can't see the link to the end. So, we have been thinking for some time of looking at *transition* scenarios.

One of the suggestions I would like to make is that those of us who are in this community, including DOD, go together on this. I would like to suggest this proposition not only for us as this group, but also on a broader professional basis to get together with those other people in the government who are interested and address these aspects.

I believe another factor that continually

stands in our way is economics. Bob Jackson of Conoco mentioned the matter of rotating money. When you look at it that way, it doesn't really cost all that much. We also have to take a look at what it means to the public. It is not a proposition of synthetic fuels that cost twice as much to the user because the user is not going to see a tank full of synthetic fuel. He is going to see fuels that are rolled in with other fuels. It may take us 40 years to get to the point of totally synthetic fuel, but how long will it take us to get to 10 percent? It will probably take us 10 years to get to 10 percent, and that differential is not going to be all that great. So, I think we have to get across the idea that we must look at the economic picture and our destiny in a little different light and try to attack it on a practical proposition rather than this highly theoretical approach.

**Speaker 8:**

I would just like to pick up on the economic point. I would like to make an observation, namely that in terms of the price of synthetic fuel, let us realize that it is never going to be competitive on its own with Arab oil. The Arabs went to the same schools that we did, and they will simply price it so that there is a significant differential. The main purpose here is to decide what that differential can be. In other words, what we are buying is security. What is the price of that security? That is what should determine the amount of subsidy that we are willing to supply to synthetic fuels.

**Speaker 9:**

I just want to recap in my words what I think Gene Ecklund had suggested: that the DOE and DOD jointly undertake some sort of assessment as to what sorts of potential scenarios might exist in the future for the purpose of determining how you get from today to tomorrow to the future (transitional scenarios).

**Speaker 10:**

First, I would like to answer Gene Ecklund and say that, at least in the department of the Army that I am connected with, we will be happy to work with you on that. The process that DOD

goes through in determining requirements for new developments is to develop a set of standard scenarios. There are a lot of people who could contribute to them once they are outlined. For example, what would happen if we had a 20 percent embargo and no war; 20 percent embargo with a conflict; a 100 percent embargo? What happens if we get no embargo, but things just go on with business as usual?

There are five or six scenarios you could develop. Then you could start filling in the details in terms of the implications for the gross national product, unemployment, security implications, etc.

Last year when I was at school, we spent about a week looking at the hypothetical situation of a 20 percent embargo starting this month and what would be the implications for the United States. Of course we were all novices with very little knowledge in the energy field. The best we could come up with (3 million people unemployed) would be 100 billion dollar reduction of gross national product if the embargo went on for six months. Start to develop this kind of a situation, then bring in the interfaces. You can bring in health, emissions, the engine, and the user. You can start developing these over time and add to them, then focus them down, and people will at least pay attention when you meet together.

**Speaker 11:**

I do think that there is an undercurrent here that we might address to our advantage, at least I hope so. That is, we have certainly talked today about paying more for recovering our energy independence; but along with this discussion, it keeps coming through that we are asking the consumer to pay more for something that is worse. We ought to take on the engineering and scientific challenges to test these alternatives because I am not totally convinced that we cannot come up with something where we pay more for something better. I really think that if we do that, the market place will generate the economic muscle to accomplish our goal.

I believe that we need more experimentation going. I don't quite know how we would get greater activity, particularly in the production area of these alternate fuels. Some of the uses of these

fuels have come along very well. Indeed, when you look at the alcohols, you tend to say "by gosh, these are really better fuels than the gasoline." I think we need to carry on that end use study. But, it is well in advance of production. We need to look at production. There may be some unseen wrinkles in the production that would say "Hey, we don't have to live with this or that, here is a better way of doing it." So, if we could get that pilot production up in several of these areas (biomass production, production from coal, production from oil shale and tar sands, and some pilot experiments that are producing these quantities), we may wind up with something that we prefer to market.

**T.J. Timbario:**

How do we get those? I am going to postulate that we have a chicken and egg situation. We can't do any end use testing because we don't have any fuels to test. So how do we get there?

We all know that through the Navy, PARAHO project work, they hope to get some fuels very shortly. That is great. The military is moving out very nicely. They will have a lot of experience based on some of the test work to date and future testing that will continue when fuel from PARAHO is available. How do we get those fuels for other applications that need testing? Is there some sort of cooperative arrangement that we can establish with the military? Can the military supply these fuels to those people in the various industrial sectors who need to test them in order to determine end use effects and problems? Is it possible through some sort of cooperative arrangement that DOE could obtain some of those fuels and somehow link with industry for testing and development? How can we accomplish that?

**Speaker 12:**

I can report right now what is going on presently. I just want to tell you how we are doing it, and that is basically going and knocking on doors, asking for samples. We are doing some detailed, basic studies looking mainly at the fuel stability. We are using mainly cuts and looking at potential

stability problems that are going to occur down the road. Again, we are trying to provide a basis, a foundation, and some information that people can use.

Our first report (which will be on some of the fuels that the Navy and Air Force have been reporting on today) will be coming out in about two months.

But what we have had to do is to go beating on doors and plead with people for materials. Sometimes it is available and sometimes it is proprietary. That is the only way we have found to be successful. We are within DOE.

I know, though, that the problem still is present that we need to get around and that is how can we shorten that door-beating process? We can't determine what the problems are until we have a fuel to test. How can we get it going?

#### **Speaker 13:**

Probably everybody in the room is going to shoot me, but I will make the following statement:

I think the private sector will not make a syn-crude plant. \$25.00 to \$30.00 per barrel is too much, and I don't think they will do it. So, I think the federal government should put up a plant, maybe in the 4-million barrels per day group. Then they should make each of the refineries buy 10 percent of this (or something) so the 4 million barrels will be mixed in with the present crude that we have and imported crude. The hydrogen-carbon ratio would be such that it could satisfy the needs of the crude that we have. The coal has about .75 hydrogen-to-carbon ratio. I think, with the H-coal process, you can get up to 1.27. Build such a plant. Make each of the refineries buy a little bit of the product and mix it in. That will do two things: it will prolong the depletion of our own crude by so many years. We will be getting experience to make synthetic crude at the same time in case we do have an emergency. Then we won't be caught with a shortage which will really cause a catastrophic effect on the economy of the country.

#### **Speaker 14:**

This is exactly what is being done in South Africa today. All fuel industries in South Africa are required to take some sampling products.

#### **Speaker 15:**

The only ones that I know of that are doing this are the Chinese and the Russians. Maybe the South Africans can because they have the same sort of government.

I think it is a ridiculous suggestion. How could you persuade them? If there are only five oil companies in the United States, maybe you could do this, but how do you persuade some little oil company in Oklahoma that it shouldn't have its share of this oil? There is no way you could mandate anything because there are too many people that have to be mandated to.

Now, we have a company policy statement which differentiates between capability and capacity, and I think that is something that we should very seriously think about. We talk about begging some fuels. There aren't any fuels because nobody is building a plant. Something that is built in a pilot plant or in a lab doesn't mean anything. Until somebody actually builds a plant of a significant commercial size to produce something, we don't know how much it costs, we don't know how well it runs, and we don't know what sort of product it produces. Somebody has to build one. Nobody is prepared to build one because DOE keeps spending money on doing research on new processes.

The first thing we have to do is to say we will not do anymore research on any new process. If we look at all of the ones we have got and pick out the best one, then we should push that one. It may be that we will have to produce methanol, shale oil, or distillate from coal. There are processes that somebody could order tomorrow which will produce liquids which could be used in transportation. Nobody orders them because somebody is going to invent something better tomorrow.

So, we first must have the capability. We have to show that there is a capability to produce synthetic fuels in sufficient quantities to use them. If we show capability, the capacity will follow, and the price, I don't think is that important.

#### **Speaker 16:**

I think this mandating concept has come up several times. I don't know how many of you have talked to the policy and planning people there. They have made a study, and they have found out



that they could supervise about 250 refining units and therefore ensure that each one would indeed take 5 percent intake, or 3 percent, or what have you. I believe they had three or four different options. You could either inject that much percentage in your stream; you could pay a penalty; you could buy the material. That means you could increase the cost and pass the cost on to the consumer. It is a very well thought out thing, and it contrasted with the policing action that they would have to do with 2,500 fundamental producers. They actually had in mind to keep the bureaucracy at a minimum. I thought that was one of the better things I have seen in terms of reasoning within the government.

Now to get back to the matter of communications with the government, I would like for you to think for a minute what you would do if you were a congressman and you had to vote almost every day on issues that you couldn't possibly know anything about because that is the way it is. You would have to depend on highly professional, competent staffs. Where do you think those staff people get their input? They are pretty bright people, and they respond to a number of things including the number of letters they get from their constituencies.

Of course, you should really reflect on the issues that will motivate the ordinary voter to write a letter. I am not sure the ordinary voter is quite pushed around as much in his own emotions about something as far removed as fuels. I suppose he would be about some other issues closer to home, but this is maybe asking too much from an ordinary voter to be that much moved.

But these staff people are paid to analyze issues. So, I will just bring that up again. If you read carefully the reports of different conferences among the legislators (I am talking about Congress) in which they deal with issues, you come on this phase again, again, and again, "Staff recommendation is adopted." You will be amazed at how many times what they do is to follow staff recommendations. Now they have learned what they can trust and what they can't. They keep this all in balance. I would judge that there may not be the mood to attempt to achieve any kind of unanimous feeling about what is important and what isn't in terms of a committee or anything like that.

I would like to make another suggestion prag-

matically. Why don't you have this next meeting in the immediate Washington, D.C., environments? Condense this meeting to about two days. Be very, very careful about your speakers and invite government-represented people. Choose a time when Congress is in session so the staff people will be there. But choose a time which is not hectic like the last few weeks, where they have to settle the budget problems before they adjourn. In other words, really make yourselves available with a very high class program (lean and mean) in terms of having good speakers that know what they are talking about. You don't need to have a lot of history. They already know about the energy problem, and so forth. Have good speakers, and I believe you will get a lot of attention. I wouldn't be surprised if the issue were written up in the *Washington Post*.

#### Speaker 17 (E.E. Ecklund):

I would like to toss out a couple of things here. The first thing I would like to mention is that Speaker 16 has given you a little indication of how the government works, and this is a very important factor which takes a lot of us a long time to learn. There are some other factors that you have to know in order to understand in how the government works. One of them is, what happens when you write to your congressman. When you write to your congressman on a subject that is not familiar to the congressman, his staff sends it to one of the Government agencies. If it is on energy, in all probability, they pick on the Department of Energy. If it is on automotive fuels, that letter winds up on my desk, and I answer the congressman who, in turn, answers you. We have had situations where people have come in and said "I would like to do this for you." You say you don't have any money. "Well, we know so and so, suppose we get you some money?" Great, you know what is going to happen. Whatever you do, *don't* go back and write your congressman. If you can get to him and *talk* to him and *tell* him, fine and dandy. But, *don't write* because I am going to answer you. And, sure enough, a month later I have to answer the man. So, that is one item you get into. You have to get to the people through different routes than that.

Now, I want to get back to the proposition of this plant. I want to try and turn some of your

thinking around a little bit. I am going to do it in a way that maybe isn't totally proper, but we don't have any plants right now, as we have said. We need some plants perhaps. But there is no reason to build any plants. First, it is too expensive. We can't afford to do it. Second, we don't need to build any plants because when you make this synfuel, you are home free. You guys know how to use it, right?

As a result, the situation is just exactly that. Why do we have to build a synfuels plant, because we can take that syncrude and process it through our system and it will run in our automobiles like they are today. Now, I would like for you to have your attention brought to that particular subject because I think it is the heart of what we are addressing as far as *what* we need to do, differentiating between *how* we go about doing it.

**Speaker 18:**

I believe that we are wasting our time on a situation that is inimical as far as the available fuels are concerned. Let us look at history. Where have you had your scientific breakthroughs through the various eras of history such as Bacon's work, Newton, Faraday, and Maxwell which lead to tremendous enhancements of the world we live in today? To go a little bit more recently into the nuclear power of the 1940's which it came to because the work independently of Fermi in Italy, Haase in Germany, and the implementation of that work by Roosevelt through people like Einstein and Robbi, we see a lot of scientific breakthroughs.

I think that today we have to go back to the fundamentals of science and to the people we have such an unlimited source of in this country above the rest of the world in total. I believe we have to stir up a program in your scientific community, your physicists, your chemists, your organic chemists, etc. and see if they can find out what are the basic characteristics that a fuel needs. What energy can be acquired by the elements that are available to us. Otherwise, we are coming to a disaster in the next 50 to 100 years.

This is the only thing I propose, to go toward the real scientific approach and examine it and implement it.

**Speaker 19:**

Shale oil has a lot of problems, and I don't

think we are even addressing the most important points. I come from Colorado. When Colorado's governor campaigned 4 years ago, one of his major planks was an anti-oil shale policy. Just in recent weeks, there was a little bit of renewed activity in building commercial shale plants in Colorado. Union Oil and Colony Development operation were those mentioned. They both met with the governor and told him their plans. If this \$3.00 tax credit goes through, they both said that they would make this commitment. The governor told them in effect, "I don't care if you go back into it as long as it is research, but I will not stand for a commercial plant." I don't know how to overcome this type of problem.

I think another problem is economics. If it could be improved, the situation for development would be much improved. I could write out my list of ideal points for a retorting process. I don't think any of the retorting processes which are being tested would fit this ideal. I think the same holds for mining and perhaps for refining. I don't know anything about refining, but cost reduction is one place where research could do some good.

The suggestion is made that we continue or expand research efforts to make things more cost competitive.

**Speaker 20:**

One speaker mentioned a little bit ago that we have to scare the people. I guess the question is what are we going to scare them about? That is the thing I would like to talk just a little bit about. There was an article that appeared in the *Denver Post* on the 30th of April, 1978. It was called "The Coercive Utopia," and it was written by Peter Metzger of the Public Service Company of Colorado. The intent of the article is to point out how a small group of people have very effectively stopped shale oil production; they have stopped coal production. There are some 513 leases, but by all of the acts that have been passed in the last few years, they are unoperable. There are no new leases, and there will be no new leases until 1981 at least. So, coal is tied up, shale is tied up, and nuclear siting is almost impossible. So, the really effective options we have, have been effectively closed off by a very few people in the country.

My suggestion to you is that you fight the

right people! If you are going to approach congressional committees, you need to approach them with a very firm plan in mind of how to offset what a very few people have managed to do to your production program.

**T.J. Timbario:**

I would consider that as getting to second base. We haven't even gotten to first base yet. We still don't know all the characteristics of synthetic fuels or their effects of these characteristics. Once we start matching engines and fuels together, we can better define what is needed in the way of R&D. You can't produce the fuel until you know what fuel to produce. Where do you get the fuels to test? How do you find out what you need to do with it?

**Speaker 21:**

If you are looking for the leading horse in this synfuels race, it is the Canadian Alberta oil sands producers. They produce synfuel. Great Canadian Oil Sands produces 45,000 barrels of syncrude a day. They take oil sands, which is poorer in organic matter than oil shale, and produce syncrude. They produce bitumen which is a worse product than retort shale oil, and they make syncrude. Then they send it to anybody who requests it. Syncrude, the second oil sands producer, is on stream now at perhaps 100,000 barrels a day. How much do you need to test? The Chevron refinery in Salt Lake City ran shale oil through the refinery. I don't know if they had any trouble getting any to test. You can get some from Geokinetics, and you could probably get it from PARAHO. I think if you wanted some shale oil, you could get it without much difficulty. If you want something to test, I am just saying all that you have to do is ask for it.

**T.J. Timbario:**

Maybe we might pose the question to some of the DOD people. In their opinion, do they think they have enough information from an end use

point of view?

Is there enough around? Have you gone to the point where you are happy enough with the present data to say "Yes, let's go and do it?"

It is obvious from this session today that the Naval Air Propulsion Center has done a substantial amount of testing.

Can we have some comments on the amount of synfuel that has been produced and the additional research that is needed?

**Speaker 22:**

I mentioned this morning that today the petroleum fuels we get meet all of the specifications, but we still have problems with them. We don't even know what the problems are. You are saying to develop a synthetic fuel. You are saying to take a crude and run it through a hypothetical refiner (because I don't think commercial refineries would want to touch that fuel). Anyway, you are going to have a crude running through a hypothetical refinery and you are going to try to predict what that fuel is going to come out as. Suppose the crude does come on stream. Now, you are going to have several different refineries. You are going to refine it differently. Even though each one of these fuels is going to meet specs, they are going to have their own particular problems, which again are not defined by the specs.

The fuels that we are testing on the 100,000-barrel oil experiment are meeting the specs. In every respect, they are excellent fuels. But we are still going to have problems with them, because we don't know the chemistry. So that, right now, rules out any attempt at synthesizing a synthetic fuel.

We must know the chemistry. More characterization is required. We must have that fuel in order to do those characteristic studies.

**Speaker 23:**

In this next production batch of PARAHO fuels, if you could advertise as DOE that you would make them available to any engineering organization that would do some research as long as they would provide the data back, it would be easier than for us to go out and beg to have this used.

We did get some data back for the first PARAHO batch, and this was consolidated in a DOD report. But, we had to specify a little in our own R&D work and then ask other organizations to test it.

So, the suggestion is that DOE furnish batches, combinations, whatever sorts of synthetic test fuels to industry, provided the data comes back and it is useful. Just to get the fuels *out there* is what counts.

**Speaker 24:**

I am confused at this particular point. I need some clarification here because I think it is pertinent to the situation. I know that there have been some synfuels that have been tested in turbine engines. Has the military had synfuels that they have tested and used that have been stable, meaningful, purposeful fuels?

Southwest Research did all of this characterization of the fuels of this first batch and told us the characteristics. The characteristics were indeed *not* right on spec and stability was a problem. Technically, SwRI could probably give you a better description of it. I think you are asking whether that first batch was right-on, stable, and commercially as acceptable as any other gallon of petroleum fuel. The answer to that first batch was NO.

**Speaker 23 (again):**

I think I am even going a little bit farther than that. From all the impressions that I have gotten, Bartlesville has tried to test these fuels and has never been able to come up with any repeatable results because they were not thermally stable.

There have been conferences on thermal stability along the line.

Southwest Research has had a contract for 2-1/2 years with EPA to run some tests on some synfuels and hasn't done a nickle's worth of experimental work on it because they haven't had any fuels to work with. So, that is why I say, I need some clarification here. The impression that I get is that we haven't had any fuels that have been really worthwhile testing to any degree to find out whether or not we have problems with them.

**Speaker 25:**

We had a fuel that was made from shale oil

which was stable. We ran an engine test on that fuel, and it was attached to an airplane. We flew the airplane over 1,000 miles. We didn't use any magic. The fuel came from the Navy program. There were some instability problems, but we cleaned it up with conventional clay treatment. There was no problem with the fuel, it met all of the conventional specs. It was qualified by the quality control laboratory, and the test was rather routine. There was nothing extra done, except that we had to run a qualification test in a small engine beforehand. But, we found no difference in any of the engine tests. There were no abnormal amounts of radiation from the flame, and there was no abnormal soot formation. So, we have tested a fuel, we ran it in an airplane.

I think some of the questions that are being discussed now can be solved. You talk about the availability of crude. We are familiar with the 100,000 barrels that PARAHO produced for the oncoming Navy program. Occidental has initiated a retort which is going to produce 75,000 to 80,000 barrels in the next six months. Geokinetics is producing more crude than they can get rid of. You can almost get it for the asking. So, there is enough crude available to do the testing that needs to be done. Samples could be produced in a small refinery or in a pilot plant.

I think the real crux of the whole problem concerns the developers. If you go out and talk to these folks, you will find out what the real problem is. We have talked about environmental issues and the problems that these folks face in trying to get an industry started. It is so frustrating, you wonder why they even try. Every time they seem to get something going, there is a new legal action. They spend most of their time in court.

There seem to be problems within the government about shale oil leasing. People are standing around saying "When is the next lease going to come up, 1981?" There seems to be all kinds of problems in that area.

A friend of mine is really active in the Sierra Club, but, also, he is a very practical chemist. I have spent quite a bit of time with him. We have been out to several sites together (recovery sites). He believes that within a club like the Sierra Club, there are dedicated scientists who quite naturally don't want to disrupt the environment. But when faced with other possibilities, he thinks there are

possibilities of fragmenting an organization like that. So, by all means, talk to the guy on the street. But, also try to perhaps fragment organizations like that.

**Speaker 26:**

I wasn't going to say anything, but I am the guy with the fuel. Out of this 100,000 barrels that the Navy is having refined, I expect to get close to 29,000 barrels of middle distillate. And I don't know what to do with it. The reason I am reluctant to come up here and tell you that is I know I am going to get a bunch of ideas that I don't want. We are afraid, like everybody else, of Bill Proxmire's Golden Fleece award so we would rather not hear all the crackpot ideas. Within the Navy, there were some tests run on the first 10,000-barrel experiment. It was tested in engines, some boiler burners, small diesel engines, and some gas turbine combustors. Depending on who you talk to, the tests were significant or a complete waste of time. Too often, I have felt that within the DOD and also with the government in general, we do too many of the "let's make a show" kind of demonstration. Probably some of our tests fell into that category. I am cynic enough not to want to repeat that. So, with the 29,000 barrels of middle distillate which I expect to get, I would like to see that some significant results come out of the tests. So far, within my own house and other experts that I have access to, I have not gotten what I consider to be good, solid, sensible recommendations. I am

afraid that what we will get out of it will be such conclusions as: "there was no significant radiation; there was no significant smoke. The thing didn't seize up, and sure that is fine." That is good to know, but it seems to me that good professional scientists can think of significant tests that can be run and significant data that can be measured so that you haven't just burned up 29,000 barrels of fuel without having gotten some results out of it. As I look back on the previous tests, I say, "well, we burned up 10,000 barrels of something that was rather expensive to produce, and I think the sum total of what we learned from it was that it had a lot of wax in it and our diesel engine gummed up, and because of the high nitrogen content it was not stable." That is about as much as we got out of it. I will be open for suggestions from the engine manufacturers and anybody else who has some good advice in this area. As I said, we are not anxious to get Bill Proxmire's Golden Fleece award, and therefore I am not saying that we have fuel to give out to you to run whatever kinds of tests you want to run. We in the Navy have our immediate problems. Our immediate problems are with the prime movers. For that reason, we probably can't give much of it (if any) out to industry and for testing whatever engines you are interested in. But I am certainly open to good, sensible suggestions on the kinds of data that ought to be gathered from testing this in gas turbines of the type the Navy is using, and diesel engines of the types the Navy is using, and in boilers of the types the Navy is using.

## IDEA LIST

**NOTE:** The following are points or opinions made by individual attendees (not identified) in more-or-less chronological sequence. Many of these have been paraphrased in the SUMMARY section in the beginning of these proceedings, but are reproduced as accurately as possible here to retain the original flavor of the comment.

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- Organize a group to bring attention of the synfuels problem to the proper congressional authorities. Whether this should utilize the services of SAE, ASME, etc., is uncertain. ESCO (Engineering Society's Committee on Energy) is a possibility since it represents all the major technical societies.

Counter argument to using professional societies is their credibility gap. The lack of Federal credibility with the general public may well be due to the fact that they manage to get the energy there without advertising the fact. Coal, natural gas, fuel oil, etc., seem always to be available during the extremely critical periods of the winter regardless of the headlines. Consequently, the people are skeptical about an "energy crisis."

Public figures, if they are agreeable, should be utilized in shocking the public into acceptance of an energy problem. The counter argument is that we are simply figuring out ways for other people to do our own job.

The transition period of introduction of non-petroleum liquids should utilize existing refineries. Concept of new refineries dedicated to syncrude conversions-refining will likely not materialize in this century.

- Fundamental question is just what to do with our vast domestic resources to include shale and coal. If specifications remain the same, the refinery operations and engine design criteria will remain the same. If a "new fuel" gains momentum because of energy savings at the refinery or somewhere in the logistical train, then refinery operations and engines R&D must be accelerated. The present petroleum crude import glut is a major barrier in gaining support for R&D aimed at eventual solution to long-term problems. Synfuels should not be utilized as transportation fuels simply because this is the only definable DOE program in existence at the present time. This is, in fact, the worst place to start a new fuel. Utilize it in stationary powerplants, profit by this experience, and

then make the transition into transportation applications.

- Economical uncertainties as to the projected cost of pure synfuels may not be as significant a barrier as presently envisioned because it may take 20 to 40 years before a pure synthetic fuel is utilized in a transportation situation. Scenarios involving 10 percent, 20 percent, etc., of nonpetroleum constituents in transportation fuels should be generated cooperatively by the several technical sectors.

- The price of domestic synthetic fuels is never going to be competitive on its own with imported Arabian oil because the Arabs will simply price their oil so there is a significant differential. The main consideration is exactly what that differential can be. That is, we are purchasing security with our domestic nonpetroleum reserves and what is the price of that security? What should determine the amount of subsidy that we are willing to provide for synthetic fuels development? DOE and DOD have openly expressed a willingness to cooperate in generating political transitional scenarios for synthetic fuels.

- The private sector will not make a syncrude production level plant. The Federal government should totally subsidize a plant, perhaps at the four-million barrel per day level. Then they should make each of the refineries interested buy 10 percent of this so that the four million barrels per day of syncrude will be mixed in with present petroleum crudes, including domestic and imported crudes. This seems to be the most reasonable approach to introduction of synthetic crudes.

In support of the above argument for a Federally-initiated industrially-cooperative syncrude introductive approach, this is exactly what is being done in South Africa today. All fuel industries in South Africa are required to take some sampling products for commercial utilization.

A forced cooperative arrangement is also being used by the Chinese and the Russians because of their particular forms of government. This

apparently extends to South Africa as well. It would not work in the United States because there are so many domestic oil companies of such a variety of sizes.

- Perhaps some of the DOE's synfuels R&D funding for new processes might be better spent on building pilot-or production-scale plants. Utilize existing well-proven 30- and 40-year old processes and build a plant and get on with it.

- Have the next meeting on this subject in the immediate Washington, D.C., area. Be careful about which speakers and Government people are invited, but do invite them. Choose a time when Congress is in session so the congressional staff people will be in attendance. Do not choose a time such as the last few weeks when Congress is about to adjourn because they are far too busy to give it their undivided attention. Emphasize what can go on, not what has been going on. Congressional staff already know their history on the energy situation.

- The present Governor of Colorado was

elected on an anti-oil shale plank. In recent weeks, he has met with Union Oil and Colony Development, who would commit to shale oil development if the \$3 tax credit goes into effect. The Governor replied that he didn't care if these companies go back into it as long as it is bona fide research; he will not stand for a commercial plant. Impasse.

- Canadian Alberta oil sands (Great Canadian Oil Sands) produces 45,000 barrels per day of syn-crude from Athabasca tar sands. They will sell it to anybody who wants some for utilization or R&D. Similarly, shale oil materials can be gotten from such companies as Geokinetics, PARAHO, etc.; all you have to do is ask for it.

- The PARAHO operation emphasizes Mil-spec fuels totally. Consequently, the entire program will merely establish the fact that Mil-spec fuels can be produced from oil shale and successfully utilized. Economics and energy optimization data cannot be gleaned from this program.