July 18, 2006

To: Global Alliance for Incinerator Alternatives

The document **GASIFICATION, PYROLYSIS & PLASMA INCINERATION**

This reply addresses all of the points mentioned in the above document.

1. What are waste gasification, pyrolysis, and plasma treatment/disposal technologies?

The technologies referred to in the referenced document have a few common pitfalls, however there is a gasification technology that has been in development for 14 years and commercially operational for the past 3 years in Europe that mitigates the negative impact of the thermal conversion process. It should also be understood that although the European Union refers to all these technologies as incineration, this argument should not be used to judge all technology. The EU has an extensive understanding of these technologies, more than in the U.S., and the emphasis is on implementing and enforcing stringent emission and environmental regulations and less emphasis on terminology rhetoric.

2. Releasing Toxics:

Due to the nature of classical Gasification and Pyrolysis, oxygen is introduced in a second stage causing oxidation and combustion. It is fair, in some cases, to consider this a form of incineration which does produce some amount of the toxic emissions and residue as mentioned. However in a process that does not introduce oxygen and does not combust the gas, no stack is required. Operating without oxygen at temperatures in excess of 2200 to 2800 ^{o} F (1200 to 1500 ^{o} C), neither oxidization nor combustion occurs, and therefore, based on basic chemistry, toxic emissions such as dioxins and furans can not be generated and chars and tars do not remain.

At these temperatures virtually all of the organic material is decomposed into synthetic gas leaving a small amount of inert, non-leachable ***"clean sand"*** solid residue that contains no ash, char or tars.

This technology thermally converts the vast majority of the in-feed material into the basic elements of hydrogen and carbon monoxide which are usable sources of energy. Due to the fact that energy can not be created or destroyed, the energy that was contained in the in-feed material is converted into other forms of usable energy. The capability of this technology has been independently verified by a two year study conducted by the European Union Committee on Energy and the Environment, which validates the claims that "pollution free" and "zero emission" thermal conversion technology does exist.

It should also be considered that numerous waste streams exist that do not lend themselves to anaerobic digestion technology or a "zero waste" policy; things like car tires, carpet scraps, and numerous forms of industrial and manufacturing waste, to mention a few, that must be eliminated. This technology is an environmentally sound means of converting these waste streams into clean energy that can benefit society.

3. Wasting Energy:

Regarding wasting energy it should be noted that in the refining of gasoline, generation of commercial hydrogen and many of the new alternative fuels like Ethanol and Bio-Diesel that the conversion process utilizes more energy to generate the fuels and energy carriers than is available in the end product.

The technology referred to in this reply however is very energy efficient and on the average utilizes less that 20% of the energy released from the in-feed material. This fact has been independently validated by an internationally respected engineering firm. This simply means that 80% or more of the energy contained in the in-feed material is converted into usable energy while eliminating the waste material being processed, providing a clean safe alternative to waste elimination while recovering the valuable energy.

The process which works equally well on virtually all biomass or organic, toxic and non-toxic waste streams, results in a clean, high energy gas that is not diluted through oxidation and is typically stored like natural gas and used in a variety of applications as defined below.

Liquefied Fuel Generation

Based on the quality and high energy content of the synthetic gas the gas can be cost effectively and easily converted from synthetic gas into commercial liquid fuels such as Ethanol or Bio-Diesel. This is a cost effective means of generating alternative fuels while eliminating waste.

Electrical Generation

The synthetic gas consists of an energy rich, clean gas similar to natural gas, which can be stored for later use. Due to the high energy potential of this gas it is well suited to operate both internal combustion and gas turbine generators. In addition, in most cases where the in-feed material consists of waste material, the resultant electrical generation is considered renewable energy generated with zero fuel cost. In fact in most cases the waste elimination portion of the process creates either cost savings or a revenue stream.

Hydrogen Generation

Due to the ultra high temperature of the process the resultant gas composition is typically high in hydrogen. Since the gas exits the process at high temperatures, typically (1100 ^{o}C) 2200 ^{o}F a simple gas shift or steam reforming process can boost the hydrogen content of the gas to over 90%. Using existing technology this hydrogen can be separated and used in transportation vehicles, fuel cells or highly efficient gas turbines.

Heat/Steam Generation

The off-heat from the process, combined with using the synthetic gas in boilers, produces an excellent source of heat for generation of heat, steam or cooling that can be used in commercial or industrial applications. In many cases the waste material from a manufacturing process can be used to generate heat or steam required in that process, thus minimizing the use of external energy for manufacturing. This represents only one simple example of the use of the heat and steam. In addition the steam can be effectively used to operate a steam turbine to generate electricity.

Technical and Financial Problems:

Related to technical and financial problems, like any new technology, challenges exist early in the development cycle that can be interpreted as failures. However in all science and engineering if all work stopped when a problem was identified progress would never occur. The technology referenced in this reply has performed well for the last three years in commercial operation and the German government has recently issued a permit for this technology to process 21 waste streams ranging from waste water sludge to chlorinated plastics. As always this technology must meet and maintain operations within the stringent German emission and environmental standards, for which it has a proven track record.

In summary:

As we can see by the above data, making a blanket statement that Gasification and Pyrolysis technology can be equated with incineration is an inaccurate statement. The fact is that clean, effective and efficient Ultra High Temperature Gasification technology exists. Technologies like the ones referenced in this reply can and will bring valuable solutions to the challenges facing the U.S. including California. Clean effective solutions are available today and should be evaluated with an open mind from a scientific perspective in order to solve today's problems related to waste elimination and energy generation.

Conservation, recycling programs, anaerobic digestion and "Zero Waste" policies are excellent steps in the evolution of being more responsible for air quality, water quality and the environment. However these programs and technologies still fall short of a total solution. As has been stated in numerous forums, some type of thermal conversion has a place in the elimination of waste material and the conversion of that material to usable energy. Like all the above mentioned methods this technology does not provide the silver bullet for all waste problems and it should not be the first consideration. However as long as an environmentally clean, commercially viable, financially sustainable thermal conversion technology exists it should be considered and accepted as a viable alternative.

As additional reference the U.S. EPA has determined that environmentally sound gasification technology has a viable place in both the waste elimination and energy generation market.

As an additional reference the following link describes gasification as outlined by the US EPA:

http://www.epa.gov/environmentaltechnology/forum/problem/waste_gas.html

In conclusion we do not believe the article is an accurate representation of current state gasification technology and that serious consideration should be given to understanding state-of-the-art technology and learning from European experience.

For more information please call or e-mail Herb Teague herb@ils-partners.com 530-524-5648.

Attachment A

The list below provides a good example of waste streams that are proven financially viable using the technology referenced in this reply. It also provides a good example of the flexibility of the technologies capability.

- ✓ Animal Waste — 25 million dry tons per year.
  (The California San Joaquin Valley dairy farms alone create more than 17,500 dry tons of manure daily)
- ✓ Automotive Shredder Residue — 5 Million tons per year
- ✓ Waste Water Sludge — 2 Million dry tons per year
- ✓ Used tires, — More than 100 million per year
- ✓ Oil sludge and tar sands
- ✓ Coal Slurry — Billions of gallons in many coffer dams.
  (As the Sierra Club knows a very dangerous and hazardous situation)
- ✓ Manufacturing resides such as carpets, PVC's and other plastics
- ✓ Animal Carcasses — 500,000 to 750,000 tons per year

Total of 1.4 Billon tons of waste per year (per the EPA)