Steam Dynamics

VOL. I JANUARY, 2014 NO. 1

A Contemporary Steam-Driven Electric Dynamo

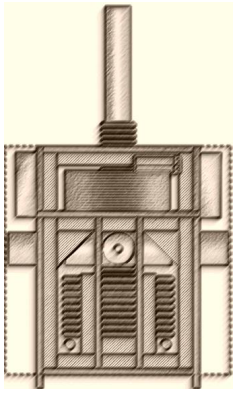
With sufficient, inexpensive clean energy we can be thermally comfortable, recycle water, grow food, process waste, manufacture widgets, etc. while breathing cleaner, healthier air. Usable energy is the basis for all human activity. Using entirely solar energy is the ultimate goal.

While weighing available options toward this goal, and detecting that the solar bandwagon isn't moving quickly, we need an appropriate intermediary phase to ease the path toward total solar energy. This transition will improve our lives.

Now and for the foreseeable future, a natural gas heating and electrical generation appliance emerges as the cleanest, cheapest, least destructive and most reliable and secure means for usable energy conversion. The process is generally known as micro (less than 10 kilowatts) cogenerated heat and power (m-CHP). This system is also solar-thermal-ready for hot water, electricity, space heating and refrigeration.

m-CHP can be hybridized from established technologies. Nonproprietary, off-the-shelf components need only be reengineered and combined.

Currently, electricity to your home and gas to your heating system are each about 30% to 40% efficient. m-CHP, on the other hand, is about 80% to 90% efficient. This higher productivity is caused by reusing excess electricity-generating-heat to heat water or air.



Some m-CHP appliances generate electricity using an internal combustion engine fueled with natural gas. These have a higher pollution level than the external combustion Rankine (steam) cycle. The internal combustion engines have the typical IC maintenance with oil changes, spark plugs, etc.

You can think of m-CHP appliances as an "Uninterruptable Power Supply" (UPS) for the whole home or business. It's basically a natural gas backup system (commonly used for electrical outages) only it's designed for continuous operation, maximum longevity and minimum cost and maintenance.

90% of all electricity produced in the US, and the world, is based on boiling water (generating steam). This includes solar, as well as more typical fuels like nuclear fission, oil, coal and natural gas. This 90% is usually generated using external combustion Rankine cycle steam turbines. Turbines are more efficient than reciprocating expanders above 2MWe (2,000 hp or approximately 300 homes).

Positive displacement reciprocating engines are more efficient when operating below that generating capacity. And they are especially efficient when working with the irregular contributions of solar energy.

Newer external combustion (clean burning) reciprocating expanders (engines) require less maintenance and are more efficient.

Micro combined heat and power (m-CHP) systems are also known as cogeneration systems. They simultaneously generate both electricity and heat energy.

Practically speaking, the heat used to produce electricity is captured and recycled for water and space heating purposes.

The secret of m-CHP claims lie in the fact that they ultimately increase system efficiency by avoiding heat losses.

Rising energy prices and increasingly stringent regulations regarding energy consumption and emissions are resulting in a surge in demand for m-CHP systems.

There is, moreover, the fact that a patent was granted for an incredibly simple fluid expander ("steam engine") that can inexpensively convert (even solar) thermal energy into electricity. The positive displacement reciprocating Rankine cycle expander was invented to efficiently support improved m-CHP systems.

A January 2012 report by the John F. Baugh Center for Entrepreneurship, Hankamer School of Business at Baylor University judged this innovation as a "very good investment". The report stated the high utility value fulfills applicable needs. Also notable in the report was the lower price this expander has over similar available products. The high potential for additional products, multiple styles, qualities, price ranges, etc. is likely, along with new product spin-offs.

Manufacturing and maintenance costs are low since there are few overall parts. Consequently, there are few moving parts. Friction is very low with entirely outboard bearings (crosshead engine design) and internal compression cylinder wipers. No lubrication products ever mix with working fluids and, therefore, no working fluid filtering is required. Common applications include automatically reversing pneumatic /hydraulic cylinders, reciprocating fluid motors, and steam expanders. Engineer and machining teams consider applications from fractional to 200HP.