

ATA Perth Branch - December meeting

The guest speaker / presenter for our December meeting was Sam Pesch.

Sam operates a biogas power generating plant at Mt Herron near Mandurah.

Sam started his presentation with his definition of sustainability being the “capacity to endure” and the need to rely on natural cycles in earth’s ecosystems. Power generation from Biogas starts with the anaerobic digestion of biomass to produce methane and Sam had an interesting chart showing how the biogas plant can take its inputs from all levels of the natural carbon cycle. Biogas production has the advantage of not only reducing fossil fuel consumption but can also be used to sequester carbon since there is a solid, organic byproduct at the end of the process which can be used as a fertilizer. The bacteria used to do the digestion are obtained from the cow’s stomach and no other chemicals are used to govern the process so it produces sustainable organic fuel. Primary solar energy is converted by photosynthesis to carbohydrates which are then converted by digestion to hydrocarbons. Due to methane being a much simpler molecule than petrol etc, the burning process is much cleaner.

The biogas digesters can take a huge range of materials and most people have probably heard of plants to process piggery and dairy waste/manure, but these sources are not really all that good since they have already been through the animal and had much of the sugars already converted to methane. Sam produced a table showing how much methane is generated per ton of various materials such as baking scraps $650 \text{ m}^3 / \text{T}$, grass $100 \text{ m}^3 / \text{T}$. Processed waste foods are generally much higher in energy content and a 2 litre carton of milk can be converted in to the equivalent of 150ml of petrol. The system currently obtains most of the inputs as dairy waste/excess products which are free and the dairies are glad to have a place to dispose of this waste rather than simply dumping. In fact for some of the plant inputs they are paid to dispose of them.

The digester mix is very dilute, comprising 95% water and 5% biomass which all has to be preheated to 40 C before digestion starts. All of the heating requirements are supplied by the waste heat from the 1.4MW generator (piston engine + generator) which burns the methane and produces power. The waste heat is also used in on-site greenhouses and to heat the operator’s houses and swimming pool – i.e. cogeneration. The overall plant structure is very simple and easily operated by 1 person although most of it is automated.

The plant doesn’t currently operate full time but specifically targets peak periods and the power is sold to the wholesale energy market. 8hours of gas supply can be stored in the 3 digester tanks so this renewable energy process is very useful in being able to target peak loads.

Sam made an interesting comparison of the digestion/methane burning process to composting these same waste organic products, in that composting produces CO_2 and small amounts of methane directly, which are released, whereas digestion first diverts the products to methane which is burnt to produce energy and then produces the CO_2 . Germany is much more advanced in the use of biogas with a few villages running

completely on their own generation, including house heating and even exporting gas and power. The biogas can be fed in to the reticulated natural gas network.

The biogas plant can generate 2.5x more energy per installed MW than a comparable wind generator and uses far less material for construction. Biogas is the only technology with the capacity to **reduce** the amount of GHG released to the atmosphere during generation (-409 gCO₂e per kWh) e.g. by preventing the release of methane from manures. Even wind generators are rated at +24 gCO₂e per kWh due to the manufacturing process, solar thermal is 27, hydro 40.

Sam had some data on studies from Europe on the feasibility of supplying all their required natural gas from biogas and also calculations showing that in Australia, 0.3ha of corn could provide all the energy requirements for the average consumer at a yield of 2.5T/ha.

Our next meeting is at 6pm on the 16th of February 2011 at Ecentral Tafe.
6pm start