

# DANSK BIOMETHANOL APS

## The ICI Methanol Process

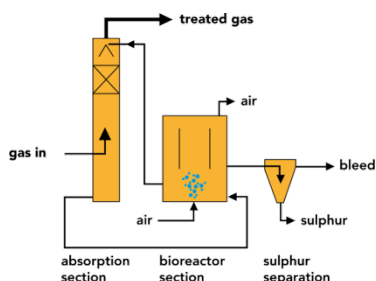


The Methanol plant at ICI in Billingham, September 1970.

Methanol is made by the ICI Low Pressure Methanol Synthesis Process<sup>1</sup> in 4 steps.

### STEP 1: FEED PURIFICATION

The two main feedstocks, natural gas and water, both require purification before use. Natural Gas contains low levels of sulfur compounds and undergo a desulfurization process to reduce, the sulfur to levels of less than one part per million.



Impurities in the water are reduced to undetectable or parts per billion levels before being converted to steam and added to the process.

<sup>1</sup> Methanol Holdings (Trinidad) Ltd. commissioned its M5000 Mega Plant in November 2005. The plant produces 5,000 metric tons of methanol per day making M5000 the largest methanol plant in the world.

We use same process for 21 t per day making ours the smallest plant in the world.

### STEP 2: REFORMING

Reforming transforms the methane (CH<sub>4</sub>) and the steam (H<sub>2</sub>O) into synthesis gas comprising hydrogen (H<sub>2</sub>) and carbon monoxide (CO).



The reaction takes place by passing hot mixture of methane and steam (860 °C) over a nickel catalyst.

Carbon dioxide (CO<sub>2</sub>) is also added to the feed gas stream at this stage to increase methanol yield. This process is carried out in a Reformer furnace which is heated by burning natural gas as fuel.



Trinidad steam reformer.

### STEP 3: METHANOL SYNTHESIS

After removing excess heat from the synthesis gas it is compressed before being sent to the methanol synthesis reactor. Here the reactants are converted to methanol and separated out as crude product with a composition of methanol (68%) and water (31%). Traces of byproducts are also formed. Methanol conversion is at a rate of 5% per pass hence there is a continual recycling of the unreacted gases in the synthesis loop.



The reaction takes place by passing the synthesis gas through a packed column of a Cu-Zn catalyst at approx. 230 °C and 65 bar.

This continual recycling of the synthesis gas however results in a build-up of inert gases in the system and this is continuously purged and sent to the reformer where it is burnt as fuel. The crude methanol formed is condensed and sent to the methanol purification step which is the final step in the process.



Trinidad methanol reactor.

### STEP 4: METHANOL PURIFICATION

The 68% methanol solution is purified in two distinct steps in tall distillation columns called the topping column and refining column to yield a refined product with a purity of 99.85 % methanol classified as Grade AA refined methanol.

The methanol process is tested at various stages and the finished product is stored in a large secured tankage area off the plant until such time that it is ready to be delivered to customers.