Permitting Support centre
Environmental Permitting Team
Quadrant 2
99 Parkway Avenue
Parkway Business Park
Sheffield
S9 4WF

Our Ref	Tel (Direct)	Date
KB/PSC/02	01691 775320	12th May 2010

Dear Sir

Subject: Notification of a request for variation to Permit number BW9999IG / KP3735SC – Case reference number WP3138TR, EPR – EA/EPR/BW9999IG/V004

Introduction

This letter is written in support of our request for a variation to the above permit. We have shared our plans with Julia Frost our local EA inspector and on the basis of our discussions she has stated that the permit variation is a Minor Technical Variation, with minimal changes to the conditions contained within the permit.

Proposed Change: To replace the existing reactor on Formalin Plant 1 with the installation of a new Formalin reactor and associated control systems

Formalin Plant 1 Reactor

The existing reactor is nearly 25 years old and reliability is an increasing issue in terms of satisfying our required demand for product. We also have issues with the control system for plant 1 which we also intend to replace as part of this project. Although we intend to replace this plant due to age and issues over reliability the plant is still safe to operate both in terms of environmental risk and the safety of people both on and off site.

The Technology

Formaldehyde is produced by the air oxidation of methanol. The reaction occurs in the gas phase over a metal oxide solid catalyst. Water vapour is also produced by the reaction.

The chemical equation is:

$$CH_3OH + \tfrac{1}{2}O_2 \Rightarrow HCHO + H_2O$$

The exothermic heat of reaction is 159 kJ per gram mole.

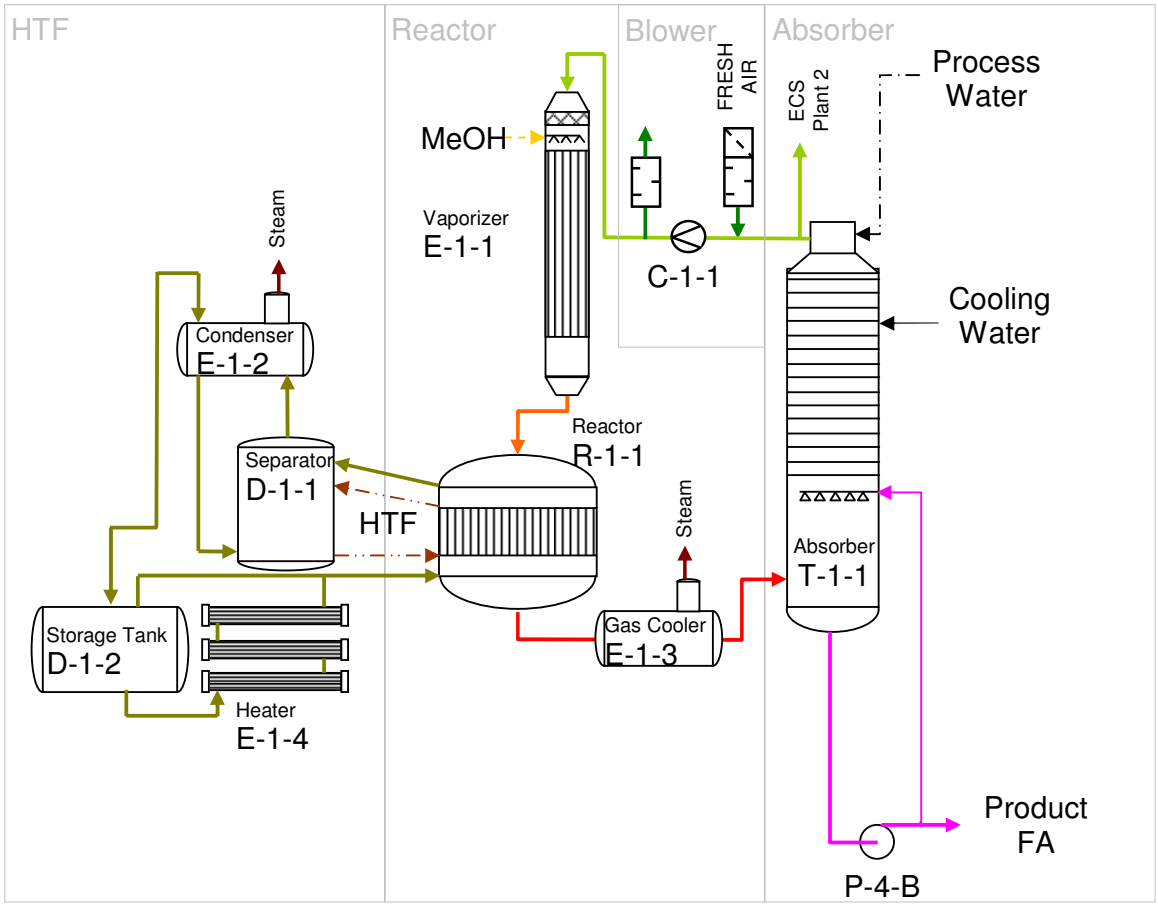
The chemical conversion is 91 to 94%. The yield loss is composed of unreacted methanol and the production of carbon monoxide, dimethyl ether and formic acid. The by-product gases produced along with formaldehyde gas not absorbed are oxidised to carbon dioxide and water in the catalytic oxidiser before discharge to atmosphere.

The raw material feeds are methanol, free air and a small amount of water doped with caustic soda (having less than 500 ppm sodium) to achieve the final product specification of up to 55%w/w aqueous formaldehyde solution (formalin).

Process Description

The Formox process is well known in the group, with several plants producing formaldehyde.

Figure 1 : Simplified Flow sheet of Formaldehyde Plant 1



There are two similar Formaldehyde plants, plant 1 and plant 2. The description below is based on plant 1. See Figure 1 for a simplified flow sheet of the process.

The methanol liquid feed is continuously fed into the tube side of a vaporiser (plant reference E1-1) where it is evaporated and mixed with the recycled 'air' stream (inlet air at about 70°C). The resultant gas stream (at about at about 115°C) is fed continuously into the top of a fixed bed catalytic reactor (plant reference R1-1).

The reaction takes place in packed tubes, within the reactor, with boiling heat transfer fluid (HTF) outside the tubes in the shell. The boiling HTF at between 0 and 1.6 gbarg raises the temperature of the inlet gas from 115°C to about 235-305°C. The exothermic reaction caused by the molybdenum oxide catalyst then raises the temperature to 300-400°C Most of the heat of reaction passes to the boiling HTF.

The HTF vapour is condensed in a condenser (plant reference E1-2) with the heat being used to raise steam for use on the MDF refiners. The condensed HTF recycled back to the reactor shell.

The gases leaving the reactor (product gases) consist of formaldehyde, 'air' and the traces of by-product and pass back to the shell side of the Gas Cooler (E1-3) to provide the heat to vaporise the liquid methanol feed. The product gases leave the vaporiser and pass to the absorbers (T1-1) where they are both cooled and dissolve in water. The 'air' stream with traces of by-products, methanol and formaldehyde leave the absorbers and are split into two streams. The majority of the flow (70%) recycles to the vaporiser via the air blowers and free air make-up system. The minority of the flow (30%) vents to atmosphere via the thermal oxidiser (plant reference E2-18) which converts the gases to carbon dioxide and water before discharge to the stack.

The aqueous formaldehyde solution created in the absorber is concentrated to about 55%w/w at the base of the absorber (plant reference T1-1) and this is circulated using pump P4-B. A controlled portion of this circulating flow is sent to the formalin storage tank as the product stream.

The steam generated in E1-2 has an associated boiler feed water tank (plant reference E2-8).

The HTF used to cool the reactor and to raise the steam has an associated storage tank (plant reference D1-2) and a heating system (plant reference E1-4 A/B/C) to raise the temperature of the HTF for plant start-up.

The formalin produced on each plant is pumped across to the tank farm via a common pipeline. Formalin is stored at the tank farm in four 290-ton storage tanks. The tanks are heated and insulated to prevent the formalin cooling and polymerising to a solid. Only one tank is filled at a time for quality control reasons. When a tank is full valve positions are changed to direct the formalin to another tank. The tank recently filled is agitated and analysed. Typically the

stock level is maintained at two full tanks and two empty tanks. In normal operation tanks T2-2A/B/C are rotated regularly with tank T2-2D out of service. Tank T2-2D comes into service during stock building for shutdown or if another tank is taken out of service for cleaning.

N.B. The above mentioned is summarised in a User Required Specification and can be made available upon request, but is classed as commercially sensitive and as such must not get into the public domain.

Off-plots

The formalin plant has three cooling towers, supplying cooling water to the two formalin plants and the reactor R210 at the Resin Plant. Make-up water is supplied from the borehole at the formalin plant.

Two air compressors supply compressed air to the plant for air operated equipment and instruments.

An ion exchange unit supplied predominantly with RO water provides demin water for use in the process and steam raising equipment.

The plant has its own fire fighting pumps, ring main and fire water tank.

Detailed drawings of the new Formaldehyde reactor are included with this letter and are referenced below:

Kronospan Limited Drawings

The drawings are appended to this document.

Drawing no:

16486/0	Formaldehyde Reactor item R-1
/1	Tube Sheets
/2	Catalytic Support Grid + Net
/3	Nozzle Detail
/4	Nozzle Detail
/5	24” Manway
/6	24” Manway
/7	Name Plate

The Reactor

The existing reactor is comprised of 14'000 tubes in a shell which is approximately 4340mm in diameter whereas the new reactor is more in line with the reactor currently used on plant 2 and has a slimmer shell with fewer tubes (12'000) but the same tube diameter (24mm). Although the dimensions of the new reactor are different to the old the design output is the same therefore there in no additional impact on the environment in terms of discharge to air water or land.

The Control System

The existing control system for plant 1 is also nearly 25 year old (obsolete) technology which we are having trouble getting spare parts for. We intend to replace it with a Siemens S7 Control system that is state of the art and will ensure that the new reactor and existing kit associated with it performs as efficiently as possible.

Project Timeline

The whole project from decommissioning of the old plant to commissioning of the new will take 10 days with a planned starting date on the 09/08/2010. This is tied into a reduction in demand on site with the at least one of the 3 main board presses on a maintenance stoppage. If this project was delayed we would incur lost board production and hence profits. The project time line is as follows: Please see time line in the Appendix 1

1. The new reactor is due to arrive on the 06-Aug-2010
2. The hard and software for the new control system is due to arrive on the 09-Jul-2010
3. Decommissioning of the old plant will be carried out by trained and competent Kronospan Operators and Kronospan Maintenance Personnel (Electrical and Mechanical) and will take 3 days. This comprises of
    a. Draining of Thermal Oil to holding tank,
    b. Electrical isolation of the reactor system,
    c. Taking out old catalyst (by Enviroclear)
4. Decommissioning of the existing control system will be carried out by TBC and will take 5 days
5. Dismantling of Roof, Pipes and the old reactor shall start on 10-Aug-2010.
6. Steel work modification should start on 13-Aug-2010.
7. The new reactor and control systems will be installed commencing 17-Aug-2010 and take 8 days (Contractor TBC)
8. Commissioning which includes the initial training and verification of the Formalin Technicians and maintenance staff should take 8 days and shall be completed by the 01-September 2010. One Electrical Commissioning

Engineer will remain on site for an additional 2 weeks after commissioning is completed as a safeguard.

9. Formalin Plant operation during the Project – Both plants 1 & 2 will be off line for the first 5 days of the project starting 09/08/2010 and on the basis that the work programme remains on schedule with no unexpected delays we would plan for Plant 2 to commence restart operations on 14/08/2010.

Environmental Impact of the proposed change:

The proposed change to install a new reactor and associated control systems will not change the environmental impact of the Formalin Plant operations as already detailed in the permit, application and COMAH Report (revision date: August 2007). The plant capacity will be the same so the mass balance for emission to either air or water remains unchanged. Currently releases to air and water as detailed in the permit are:

Release to air is through release point reference: A1 (point A1 on plan DRG 7000/282-B) parameter /emission to air – Formaldehyde, the emission control system in this case cleans the process waste gases from any organic compounds by total oxidation over a catalytic bed.

Release to water is from the site lagoons discharging to the Afon Bradley at emission point W1 (point 1 on the site plan. DRG 7000/282-B) the final receiving water is the River Dee. Discharge is strictly controlled and only takes place when the waters to be discharged are within the permitted limits.

The limits for emissions to both air and water as detailed in the permit will not be affected. Due to the replacement of old with new the improved performance of the plant in terms of reliability will reduce the environmental risk from this process.

I hope this meets with your approval.

Yours sincerely

K Baker
Safety Health and Environment Manager