Stage II vapour recovery

The UK Government consultation paper in respect of Stage II Petrol Vapour Recovery states a deadline for compliance with Stage II controls of January 1st 2010. The paper poses a number of questions offering several threshold options with the Governments preference of 3.5 million litres, although there is also a view that a threshold should be below that figure given the current concern about controlling VOC's. All new build or significant upgrade would have to convert to Stage II. There is also reference to measures to ensure that the systems are working, manually, or by monitoring. The controls would be covered under the existing Pollution Prevention and Control Act of 2000 and enforcement would be through local authorities. If the government gives the go-ahead this requirement may come into effect during 2006.

Stage II is a means to capture evaporative emissions normally displaced to atmosphere during the refuelling of petrol into a motor vehicle. It does not apply to diesel. The vapours are sucked back into the underground storage tank (UST) by a vacuum pump fitted inside the dispenser. The dispenser is fitted with a vapour recovery nozzle such as the ZVA 200 GR which has a vapour annulus on the spout through which the vapours go. A coaxial hose is connected to the nozzle where the inner hose carries the vapour back to the dedicated pipe work inside the dispenser where it is connected to the vapour line in the ground. It's a prerequisite that the forecourt has Stage Ib in place and has the necessary vapour lines in the ground.

The technology for Stage II is mature. Stage II equipment is approved and has now been in use in many European countries for years where there have been laws mandating this since the early nineties. The main component's for the dispenser is the nozzle, hose, vacuum pump and regulation devices with miscellaneous valves and fittings. Increasingly monitoring type systems are being installed on the forecourts. The general view of the industry appears to be that with the introduction of UK legislation, these existing proven and approved systems should be used in the UK too without adding to the regulatory cost burden.

Assuming that the requirement will be legislated for poses a number of questions to meet the expected deadline for compliance of 1st January 2010, amongst some: What equipment to use? What monitoring has to be done while the equipment is operational (automatic checking or manual checking)? How to test? Do I have to install new dispenser or can I upgrade or retrofit? Have my contractors/service engineers undergone the necessary training? Etc.

Development of Vapour Recovery

California introduced vapour Recovery Stage II in1972. It came to Europe in the late 1980s, first in Sweden and then in Switzerland. Stage II was not adopted or enforced by national laws but by local governments in the Swedish cities of Gothenburg, Malmö and Stockholm. In the German cities of Munich, Stuttgart and Bremen, the move to introduce Stage II also came from the local authorities. When politicians became aware of this development, they decided to adopt the requirements nationally. This has been a growing trend and laws requiring Stage II Vapour Recovery have now existed in most if not all European countries since the nineties. The UK is late in this regard but on the other hand will have the benefit of introducing equipment which is tested and proven to last. Companies should look at what was done and what works in other European countries. In some countries some major oil companies and supermarkets started voluntarily to install Stage II in order to show themselves as environmentally minded, "clean" organisations

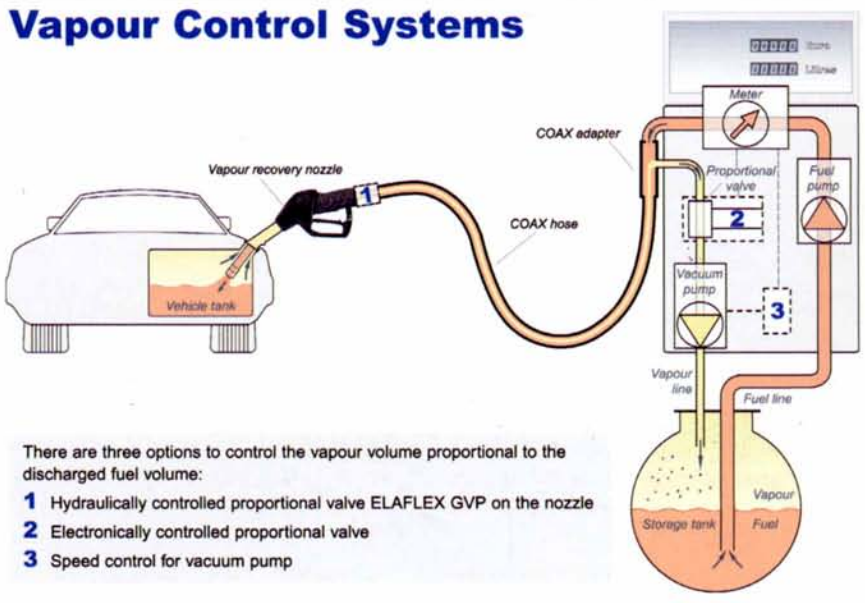
System Types

In 1990 there was a discussion on the merits of the balance systems (with a market share of more than 90% in the United States) and the active open system without rubber bellow (which was favoured in Europe). This discussion is over. Today only active open systems are used in Europe. The American balance type nozzle systems required a tight seal with the car filler neck, rubber bellows were used to enhance this, but the equipment was considered to unwieldy. The European market preferred the 'open active' system and this is what is in use today. As there is no need to achieve a seal, the handling of the nozzle is exactly the same as it is for standard nozzles in use today. They also fit into existing nozzle booths. Work has also been done by the vehicle manufactures over the years to optimise the design of the filler neck interface.

Control systems

The heart of the vapour recovery system is the device used to control the volume of vapour recovered relative to the liquid dispensed. For new pumps, electronic control devices are most often used. Special valves and the pumps electronics ensure that vapour is only sucked back when the nozzle is in use and is in proportion to the amount of fuel dispensed.

Vapour Control Systems



There are three options to control the vapour volume proportional to the discharged fuel volume:

1. Hydraulically controlled proportional valve ELAFLEX GVP on the nozzle
2. Electronically controlled proportional valve
3. Speed control for vacuum pump

According to most laws the volumetric return rate should be between 95-105%. If your recovery rate is more than 105% or lower than 95% the system is not working properly.

The volumetric return of vapour is measured with a special joint in the vapour recovery line connected to a special gas meter. The gas meter is connected to a 'socket' which is slipped over the entrance of the vapour return line of the nozzle. Instead of vapour (hydrocarbons) air is sucked in.

There are mechanical and electronic proportional devices. Electronic controls have the great advantage that the systems can easily be calibrated on the dispenser production line and later on site as part of the routine check with an electronic hand set. This is done by simulating the pulses from the flow meter and sucking in air, the so-called 'Dry Test'.

Mechanical flow controlled systems are mainly used for the retrofitting of pumps as the installation of electrical control devices is too expensive. To cut costs the ZVA 200 GRVP nozzle should be used. This has an integrated proportional valve in the nozzle which is easily adjusted. The GRVP nozzle can also be fitted on new pumps too as a low cost option.

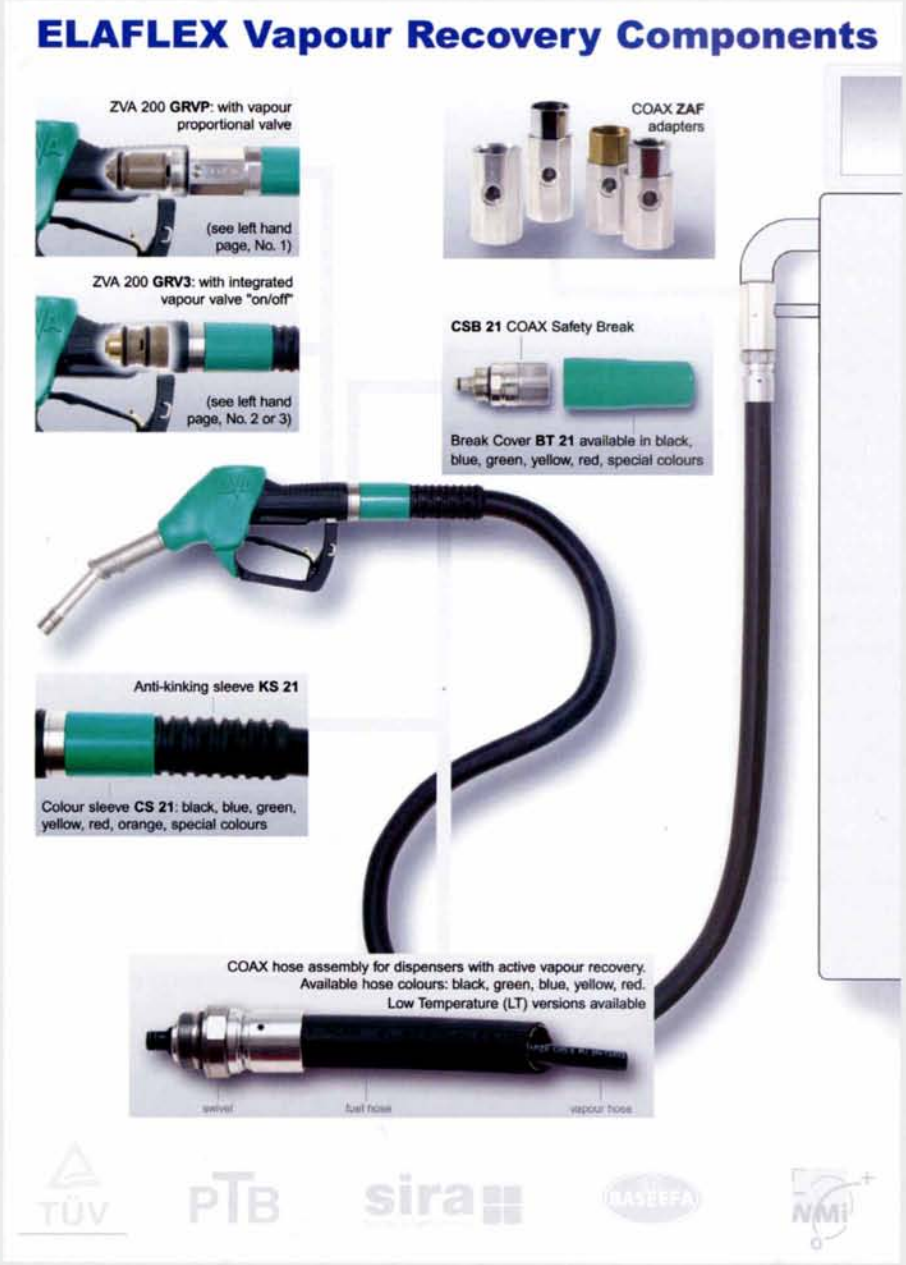
Efficiency test

According to the European law a 'type approval' test of the vapour recovery system applies. The type approval efficiency test sets all the parameters under which the system must comply – in particular, with the requirement for efficiency. In Germany, to allow for product innovation and development, the law says that the systems must operate according to the current 'state of the art.' There is in place a recognised test and approving scheme for vapour recovery by independent test authorities This is the so called 30 vehicle test, now revised as design criteria has improved which the TUV Rheinland in Germany, SP in Sweden and EMPA in Switzerland use. The TUV certification is considered as the main reference point and has published test research and reference documents as well as certifying equipment.

Dry Test (Field Test)

The routine tests are normally carried out as volumetric tests with air sucked in ('Dry Test'). Service companies may test the systems on a periodical basis. The method checks the volumetric recovery rate without dispensing fuel. Only the measured air volume recovered is calculated. The system simulates the fuel flow at 40 l/min +/- 5% by reading the electronic data from the dispenser using a type-approved handset. If the test shows the system is outside of its tolerance, the system can be reset by pushing a few buttons on the handset. The method checks the volumetric recovery rate without dispensing fuel. Only the measured air volume recovered is calculated. As the viscosity of air is different from hydrocarbon vapour, a so-called correction factor (K-factor) must be established. This method is now used in most of the countries where there are vapour recovery systems. With full electronic control systems the method provides benefits and reduces costs and workload and also reduces exposure to fuel vapours for the tester.

It is only necessary to test one nozzle per side of the dispenser and means you do not have to test every single nozzle on the dispenser. The regulations for routine tests are different from country to country and may be done during the annual maintenance service.



Some main components: The ZVA 200 GR active vapour recovery nozzle.

The ZVA 200 Is a modular designed Automatic Nozzles designed to control the flow of fuel into a vehicle tank. The nozzle closes against the flow to give a soft shockless shut off and enables the so called 'to the penny dispensing'. It also incorporates safety devises. The venturi effect on the sensing port cuts off the fuel once the tank is full and prevents overfilling. The attitude device in the nozzle body stops the flow if the nozzle is held upright. An integral safety break coupling protects the dispenser in the event of a drive off. Within the vapour

Continued on page 4

recovery nozzle body is cast a dedicated vapour channel. A special valve prevents any vapour return without liquid flow. As with all ZVA's the nozzle is fully ATEX approved and certified by 3rd party Notified Body. The nozzle is produced in an environmentally friendly manufacturing process at our state of the art factory Hiby/Elaflex. This process is further enhanced as the component parts are recycled over the years as the nozzles are completely rebuildable after years of service. Experience from the field has shown that the equipment lasts for 10 years and more. As a hint it might be a useful time to also replace existing diesel nozzles with the weights and measures approved diesel drip stop nozzle which assist in keeping the forecourt cleaner and safer.

Vapour Recovery Hose

A vapour recovery hose is a hose within a hose and is known as a 'coax hose'. The vapour is sucked back through a small bore inner hose. The design aspect of a coax hose is important. It needs to be customer friendly, lightweight and flexible and practically needs to be suitable for modern MPD's as well as the more traditional high hose dispensers. There are different inner hose constructions available. Some are of the traditional construction with rubber compounds and cheaper types with wire braiding and plastic type inner tubes. It is important to avoid kinking as this impairs the efficiency of the system. From experience the traditional textile construction is preferable (Slimline 21 COAX). The design of the VR hoses is today well proven. A


GRV3

good indicator is to see what is being used in the market place. Another important aspect to ensure long service life of the hose in the field and reduce maintenance cost is to fit anti kinking sleeves. Coloured sleeves can also be added to show grade identification which assist in reducing misfuellings. Tests have proved that the hose lifetime may be prolonged by at least a third. For modern MPD's with internal hose retractors the low temperature flexibility of the hose is of special importance for oil companies and customers when writing specifications. Practical experience has shown that the traditional rubber compounds do not offer sufficient flexibility in an internal hose retraction systems, from -15ºC and below. You could with much effort get the hose out of the retractor system, then it would not go back in.

Monitoring

The implementation of vapour recovery in the UK may require that systems installed without Automatic


GRVP

Monitoring systems are manually checked on a regular basis. The requirements in the UK are for a weekly functional check by the site operator, and records to be kept in the site logbook. A small harmonica type device may be used for such a functionality test (Quick tester - QT 92)

Basic forms of vapour recovery fault detection also exist. These may simply turn on an error indicator in the event of electronics controlling the vapour recovery system not seeing information from the dispenser main calculator, or not seeing the vapour recovery motor turn on during a petrol sale transaction. Note that such systems will still require operators to regularly check there are no error indications, and to ensure that the equipment is repaired within seven days. Generally the more sophisticated the monitoring system, the less manual checking and recording required.

Monitoring systems may incorporate a kiosk control unit that communicates with the vapour recovery systems in the dispensers, and provide a single point at which the status of all dispensers can be seen. Such systems may provide a continuous log that records dates and times on which vapour recovery systems were working correctly, and when there were faults, thus reducing the need for any manual logbooks.

More sophisticated monitoring systems may provide communications. Such systems may allow a company with several sites to monitor the vapour recovery status of all their sites remotely, possibly via the internet. Such systems may also automatically send alerts to a service/repair company when a vapour recovery system failure is detected, ensuring that the equipment is repaired within the seven day period.

In conclusion companies should plan ahead and discuss with their equipment suppliers/service contractors for the eventuality of Stage II, as to leave it to the last moment may mean that there is insufficient time or available service contractors to do the necessary work. More information on Stage II equipment is available by contacting us. AF

Anton Martiniussen


ZVA 200 GR - slim design and modern look for the forecourt, suitable for all makes of petrol dispensers worldwide.


CSB 21 - COAX Safety Break to prevent damage in the case of drive-away incidents. Use BT 21 Break Cover.


Quick Tester GR 92 - allows a fast and easy to use Yes / No functionality check of the VR system.

ELAFLEX

Elaflex Limited, Riverside House, Plumpton Road, Hoddesdon, Herts EN11 0PA T: +44 1992 452950, F: +44 1992 452911, E: ahm direct: elaflex@aol.com