

SHELL INTERNATIONAL CHEMICALS B.V.
AMSTERDAM - THE NETHERLANDS

SHELL EO/EG PROCESS MEMORANDUM 109

SUBJECT : SAMPLING SYSTEMS & SAMPLE POINTS

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INTRODUCTION

On-line analysis of certain critical properties and compositions is essential for safe and efficient operation of the process.

Accurate information on the composition of the various streams is required to operate the plant efficiently. Representative sampling systems are required.

This document provides a list of sample points. The attached drawings describe the sampling and sample-conditioning systems prior to injection into the analysers for gaseous streams.



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1 SAMPLING SCHEME

The main features of the scheme are:

1. A fast-loop to transport the representative quickly into the conditioning room.
2. A large bleed from the fast-loop to the residual gas compressor suction knock out drum to recover the sample gas from the fast loop.
3. A large number of smaller bleed streams from sample conditioners, stream selecting boxes and analysers are sent to a gas holder system. In order to maintain a reproducible analysis, the pressure of the sample to the measuring element in the analysers is to be controlled accurately.
4. An extensive system of sample gas cooling or heating, depending on the requirements for analysis. In case of EO, care has to be taken to avoid EO depletion from the sample due to water condensation.
5. Recommended line sizes to achieve short analyser response times. For oxygen analysers an overall response time of less than 20 seconds is required between oxygen flow control valve opening and indication on oxygen inlet recorder, with the exception of the oxygen analyser used for reactor monitoring purposes.

2 SAMPLE POINTS

2.1 EO Reaction Section

1. Reactor feed – downstream of common moderator feed point.
2. Reactor feed – dedicated reactor feed.
3. Reactor product – dedicated reactor outlet.
4. Reactor product - common reactor outlet.
5. Reactor coolant – drain from ring header.
6. Water in HP steam drum – bleed line to MP steam drum.
7. Water in MP steam drum – on line to primary product cooler.
8. Oxygen feed – outside battery limit.
9. Oxygen mixing nozzle – oxygen sparger rings.
10. Ethylene feed – battery limit.



11. Ethylene feed – downstream of ethylene sulphur guard bed.
12. Methane feed – downstream of methane sulphur guard bed.
13. Boiler feed water – after deaerator.

2.2 CO₂ Removal

1. CO₂ absorber overhead gas – at water KO drum prior to mixing with bypass gas.
2. CO₂ absorber overhead condensate – condensate line from water KO drum.
3. Lean carbonate – on carbonate pump suction.
4. Fat carbonate – fat carbonate line before control valve.
5. Carbonate flasher overhead – overhead line before control valve.
6. CO₂ stripper overhead condensate – on pump discharge.
7. CO₂ stripper overhead gas – any easily accessible location.
8. Carbonate storage tank – on carbonate make-up pump discharge line.
9. CO₂ product flow to OBL.

2.3 EO Recovery Section

1. EO absorber overhead gas – any easily accessible location.
2. Quench bleed – on bleed line before quench section level control valve.
3. Fat absorbent – in fat absorbent line before control valve.
4. Lean absorbent – on pump discharge before and after NaOH addition.
5. EO stripper overhead gas – upstream EO stripper tops cooler.
6. EO stripper bottom – on pump discharge.
7. Glycol bleed – on pump discharge.
8. Quench bleed stripper bottoms – on bottoms line before control valve.
9. Quench bleed flasher bottoms – on pump discharge.
10. Quench bleed flasher tops – downstream of condenser.

2.4 LE Removal

1. LE column feed – discharge of feed pump.
2. LE column bottoms – discharge of bottoms pump.



3. Residual absorber overhead – before control valve.
4. Residual absorber bottoms – discharge of pump.
5. Residual compressor discharge.

2.5 Glycol Reaction and Recovery Section

1. Aqueous EO feed to glycol unit – on suction of pump.
2. Process condensate recycle – on suction of pump.
3. Glycol reactor feed – after feed preheaters.
4. Glycol reactor product – before control valve.
5. Vapour from glycol concentrator 1 – on condensate line before steam trap.
6. Bottoms from glycol concentrator 1 – on bottoms line before control valve.
7. Vapour from glycol concentrator 2 – on condensate line before steam trap.
8. Bottoms from glycol concentrator 2 – bottoms line before control valve.
9. Vapour from glycol concentrator 3 – on condensate line before steam trap.
10. Bottoms from glycol concentrator 3 – bottoms line before control valve.
11. Overhead from glycol dehydrator – on discharge of the reflux pump.
12. Glycol dehydrator bottoms – on pump discharge before control valve.
13. Glycol bleed flasher overhead – on easily accessible location.
14. Glycol bleed flasher bottoms – on discharge of bottoms pump.

2.6 Glycol Purification Section

1. MEG column overhead – on discharge of overhead pump.
2. MEG column bottoms – on discharge of bottoms pump before control valve.
3. MEG product – on discharge of rundown pump.
4. MEG product – after MEG polishing vessel.
5. MEG recycle column bottoms – on discharge of bottoms pump.



6. MEG recycle column overhead – on discharge of overhead pump.
7. DEG column bottoms – on discharge of bottoms pump.
8. DEG product – on discharge of rundown pump.
9. TEG column bottoms – on discharge of bottoms pump.
10. TEG product – on discharge of rundown pump.
11. Glycol slops tank – on discharge of glycol return pump.
12. Heavy glycols tank – on discharge of recirculating pump.

2.7 Utilities

1. Returned condensate – downstream of returned clean condensate polishing bed.
2. Chilled water– any easily accessible location.

3 EO SAMPLE POINTS

Enviroflow sample systems must be installed on sample points in liquid EO service (>10 wt% EO). Sample points of this type must be installed directly on the process line. A fast loop is not required. Enviroflow sample systems consist of a solid metal connector sample block with two small bore canals which can be opened and closed with four small valves. The sample block is split in two parts. The upper part of the sample block is fixed connected to the sample bombe. The lower part is connected to the plant or the laboratory equipment. These two parts of the sample block have a male/female construction and can be easily connected and disconnected. This assembly can be used for taking a sample, feeding to the laboratory equipment and purging with nitrogen to empty the bombe.

Because of the very small volume in the small bore canals of the connector block, the EO released to the atmosphere, when disconnecting the sample bombe, is very small (approximately 25 milligrams).

In order to minimize the impact of the stagnant EO volume on the volume of the sample, the inside tube diameter of the inserted sample tube in the process line is 2 mm. This represents 0.1% of the sample volume. The



bombe is filled at the same pressure as the product line and a nitrogen gas cap is always guaranteed.

In the laboratory, by opening of the appropriate block valves, the EO flows into the laboratory equipment by the nitrogen pressure in the bombe. In the purging operation the two connector blocks provide the connection to empty the sample bombe from top to bottom by purging with nitrogen and making the bombe ready for taking the next sample.

Enviroflow sample systems are available from:

Dovianus BV
Terbregseweg 120
3056 JX Rotterdam
The Netherlands
Tel + 31 104 206 011
E-mail: info@dopak.nl

4 PFD's

Refer to next pages for drawings showing the sampling system and quality instruments.

Please note that the oxygen analyzer for reactor monitoring purposes (see process memorandum 108) is not included on these drawings.







