# Competence and Commitment report – past examples

## Section Aiii

**Example 1**

With a Graduate Engineer working for me I was asked to lead an investigation into technologies on treatment works to reduce greenhouse gas emissions.

My company already use hydro turbines, CHP and biogas generation. I researched other technologies in the domestic market and other industries including wind turbines, low head water turbines, photovoltaics, solar heating, ground source heat pumps and fuel cells.

I put together example applications on treatment works for each of the technologies and met with suppliers and carried out financial and carbon payback calculations using capital costs, operational costs, embodied carbon, operational carbon and information on incentives such as Renewable Obligation Certificates.

Through discussions with a supplier the idea of using biogas from sludge digestion as fuel for a fuel cell was generated. I presented the idea to my company's R&D department to enable them to take it forward.

The two most viable technologies were wind turbines and heat pumps. I arranged for a specialist consultant to carry out wind turbine feasibility studies at five treatment works. Installations were viable at two sites, paying back in less than 5 years. These projects are currently awaiting funding.

For heat pumps I worked with a supplier on a novel application using heat pumps to heat buildings onsite using raw water, or sewage as a heat source. There was potentially a large amount of low grade heat available which could also be used to heat processes such as digesters and for export.

I promoted these ideas across different buisness areas in the company and if financially viable I hope to include a heat pump system to heat buildings at a new water treatment works currently being designed. My investigation also initiated an R&D project to evaluate all the heat sources and potential uses on a wastewater treatment works.

**Example 2**

As part of my PhD, I designed and implemented novel experiments to qualify the performance of current prediction methods (literature and software-based) for flow pattern and pressure loss in vertical two-phase flows. The tests were conducted at two of the world's largest facilities for multiphase flow research. The fluids used, pipeline configuration and sizes, flowrates, test conditions and instrumentation were carefully selected and designed to represent and measure what obtains in oil and gas fields. Amongst other findings, I determined the most reliable (of the existing) methods for determining pressure drop and developed a new approach for predicting flow patterns using structure velocities. My findings were presented to project sponsors including major IOCs and published in peer-reviewed journals.

In support of my refinery's strategy to process higher sulphur crudes to improve margin, I produced a solution (a) to increase the desulphurization capacity of the LPG molsieve beds serving the crude distillers. Firstly, I customized an existing model to predict the performance of the beds with the new crudes. Based on these results, I proposed modifications to the existing 2-bed process configuration to include a third bed. My solution was approved to the design stage by management.

## Section Aiii

| | |
|---|---|
| Example 3 | a. Variations in project handovers, using the current site procedure by project managers, has led to an opportunity that I lead the standardisation by developing a new site project risk assessment procedure.<br><br>b. I have reviewed documentation on a six stage hazard review from project conception to handover. I am currently consulting with specialists on various topics I am proposing to include in the new assessment process.<br><br>c. I developed a DSEAR assessment form for reviewing a non hazardous area. There was initially only a form for areas classified as a 'hazardous area' following a hazardous area committee review.<br><br>d. I utilised an opportunity to trial a modelling (CFX promixus) software application to determine the best operating conditions and geometry, such as stirrer types, stirrer speed, reactants & solvent quantities, temperature of reaction mixture, in order to obtain optimum yield and excellent quality products. This saved the company £s on various processes.<br><br>e. Due to the use of highly hazardous materials in chemical processes, I carried out a series of Differential Scanning Calorimetry (DSC) on commonly used materials (e.g. Calcium Carbonate) to help establish the hazards and/or eliminate/minimise the use of hazardous materials in chemical processes. Also, thermal scanning calorimetry was carried out on a combination of commonly used materials (e.g.calcium carbonate) plus commonly used solvents, such as methyl ethyl ketone. I was able to establish a useful database of the results obtained for use by the chemists, which has helped to prevent exothermic chemical reactions. |
| Example 4 | ■ As part of the design of a new product storage and liquid transfer system, I proposed a pipework arrangement to allow completely independent cleaning of two feed lines feeding the same bottling line. The key difficulty was finding a method to allow the route that was not in use to be cleaned without leaving any "dead zones", however small, between the valves within the linking manifold. After review of several initial proposals that either over-complicated the problem or did not meet requirements, I developed and worked through several iterations with the equipment supplier before approving the final P&ID for implementation on site.<br><br>■ One of the manufacturing processes I had responsibility for created several tonnes of liquid washout waste for each campaign, requiring costly disposal. The washouts were required to eliminate flavour taint between near-identical products from liquid left trapped in the pipework between mixing, storage and packaging line. I realised that the main problem was due to the poor drainability of the pipework, hence requiring a rinse to displace trapped liquid - I redesigned the transfer pipework to improve drainability; the new design also incorporated an adjacent mixing tank to implement a "flip-flop" production system that would reduce the washout requirement by 70% by eliminating the need to transfer liquid into (and hence clean) storage tanks.<br><br>■ I reviewed product licence details for a batch process and realised that there was a "quick win" on batch time that could be implemented - pump rates for transferring premix phases between vessels were not specified within the licence, however they had all been fixed at the low settings specified for the finished product. I created trial documentation and detailed product risk assessment (rationalising the increased shearing of the product suspension, and potential for increased aeration of the final product mixture) ; my team then completed a production trial with the revised pump rate and confirmed there was no effect on product quality. The change was rolled out to all other recipes resulting in a 10 minute batch time reduction, allowing for 2.5% increase in production capacity with no additional cost. |