

# C&C report past examples

## Ai. Identifying or defining a problem, opportunity or project

<p>Example 1</p>	<p>I was responsible for the process design of a new water treatment works, to treat water from ten new and existing boreholes.</p> <p>Defining the raw water quality was challenging with a range of water source combinations with limited water quality data. I retrieved historic sample data from the company system discounting the results which were unrepresentative of normal borehole operation. Where there was insufficient data I arranged a sampling programme lasting several months. For new boreholes I used water quality data from boreholes which extracted water from the same aquifer. I produced an excel model to calculate the expected water quality depending on which combination of boreholes were used.</p> <p>With the raw water quality defined I could design the new treatment works. I based the design on processes which had been successful at treating borehole water of similar quality and used company asset standards for guidance. I used water quality calculations, hydraulic calculations, a mass balance, and chemical dosing calculations to size the process units. The design consisted of:</p> <ul style="list-style-type: none"> <li>■ aeration in the raw water inlet tank for oxidation of iron;</li> <li>■ sodium hydroxide dosing to increase the pH to optimise precipitation of manganese;</li> <li>■ coagulation and flocculation with ferric sulphate and polyelectrolyte dosing;</li> <li>■ chlorine dosing for oxidation of manganese;</li> <li>■ direct filtration using sand filters for solids and manganese removal;</li> <li>■ final phosphate and chlorine dosing for disinfection and network plumbosolvency control;</li> <li>■ lamella clarification and sludge thickeners to treat filter washwater.</li> </ul> <p>I produced the process flow diagram and process investigation report to communicate the design to other discipline engineers. As a design team we produced a design record file which listed the scope items for the project. This will be the basis for more detailed design and allowed the estimators to produce a cost for the project.</p>
<p>Example 2</p>	<p>The importation of reformat to my refinery regularly caused severe corrosion on an aromatics distillation unit (ADU), due to water picked up in transit and indigenous chlorides. To resolve this issue, I assembled relevant technical data and liaised with internal specialists to identify the process units required for chloride treating. I estimated the capital expenditure for this option (by benchmarking with an identical project) and found it to be similar to that for a distillation unit at the source refinery. I successfully recommended that the Aromatics business install a distillation unit at the company site in N. Europe where the reformat was sourced. This allowed the distilled reformat to be safely processed on a unit at my refinery which was designed for wet feeds (downstream of the ADU) and also offered processing flexibility.</p> <p>During my R &amp; D industrial placement at a consumer good company, I found a solution to the control of product quality in a process for producing liquid cleaners. Product quality was a key issue as differentiating aesthetics (eg dye) were added directly to the product very late in the process (on the packing floor). To mitigate this risk, I developed a correlation relating the limit of sensorial differentiation (by consumers) to absorption for eight variants of liquid cleaners. This relationship provided the basis for the design of an online (and quick-response) product quality control system. In addition, I designed experiments (sight differentiation, odour deviation and rapid age) to objectively show that certain cross variants resulting from production changeovers could be re-blended, leading to a revision of the existing production strategy.</p>

<p>Example 3</p>	<p>I was a member of a new pilot plant commissioning team. I developed a spreadsheet, which was used as a standard template for calculating overall heat transfer coefficients (U) for reaction vessels. This was used for an operational qualification of each reactor in a pilot plant. Inlet and outlet temperatures were noted during the OQ test and used on the spreadsheet. I calculated the heat transfer area for the new reactor vessels from the vessel dimensions provided in the operation manual. I calculated the difference between the jacket and reactor temperature. The jacket temperature was controlled with syltherm on full jacket. I used a known amount of water (kg) for the OQ test in the reactor and obtained the specific heat capacity of water. I was then able to use the spreadsheet to calculate the overall heat transfer coefficient (U) of the reactor. I was able to use my spreadsheet for calculating U for other reactors in the new pilot plant by repeating the above process. The U calculated has enabled the heat transfer capability of each reactor to be calculated for each pharmaceutical chemical reaction for scale up purposes.</p> <p>I developed a process to review our critical safety systems using the risk graph method (BS EN 61508). Examples of the critical safety systems were nitrogen system, x-ray machines, electrical potential testers.</p>
<p>Example 4</p>	<p>During a project to rationalise the space required for an existing pharmaceutical production area:</p> <ul style="list-style-type: none"> <li>■ I reviewed the six different production processes within the area and identified the areas where space or cost savings could be made by transferring products between manufacturing vessels;</li> <li>■ I investigated the existing process cycle times and expected packaging efficiencies to produce GANTT charts for each shortlisted option. I then determined the minimum required storage capacity for the rationalised plant to maintain continuous output to the packing hall;</li> <li>■ I identified several improvements to bring the standards of batch and ingredient traceability, and batch data reporting, up to the standards in place elsewhere on site. I then defined the key functionality requirements for the control system alterations required to implement the improvements;</li> <li>■ I identified improvements to operator safety through spill prevention and manual handling reduction for raw materials addition, and completed risk assessments to confirm QA acceptability of these changes;</li> <li>■ I compiled a full and detailed URS for the project, and used this document as a checklist for evaluating proposals from different suppliers tendering for the work at fixed price;</li> <li>■ I instigated a project to reduce the time lost due to cleaning between product formulations on a multi-product manufacturing suite. This included:             <ul style="list-style-type: none"> <li>○ a review of the production schedules to determine which formulations to concentrate on for maximum benefit;</li> <li>○ a review of the recipe differences between formulations to determine whether there was possibility for quick wins from sequential production of very similar formulas;</li> <li>○ completion of mass balances based on evaluation of vessel and pipework layouts to define the ratios of carry-over ingredients in the final quantities of follow-on products;</li> <li>○ risk assessment of the product efficacy and customer safety effects of these carryovers;</li> <li>○ definition of the stages required for project implementation including the necessary organoleptic, chemical and stability testing, in consultation with R&amp;D and QA teams.</li> </ul> </li> </ul>