

- modelling and simulation
- control design
- system troubleshooting
- technology transfer and training
- energy efficiency investigation
- software tools

HOW TO CHOOSE CONTROL ENGINEERING SUPPORT

What to Do?

When looking for support and help with serious control problems, a number of factors should be considered so that appropriate consultancy support or training is provided. The more important factors to be considered are:

1. Can you solve this alone?

We all like to be self-reliant. However, it's near impossible to maintain a comprehensive and up-to-date capability in a discipline when you only require the expertise from time to time and the issues that arise can be hard to foresee. Specialist control engineering and system modelling consultants are solving challenging issues for clients day-in, day-out and can have a great deal to offer, particularly because they encounter and resolve a much wider range of situations.

2. Is the problem likely to need a detailed examination?

For some problems, simply retuning controllers on a plant can be all that is required. This requires good engineering skills and experience. However, in some cases the problem can involve a large interconnected system and it is not clear where the problem arises. In this case, a forensic examination of the system may be necessary and a company having good modelling and simulation skills will be best placed to assist.

3. Will modelling be necessary?

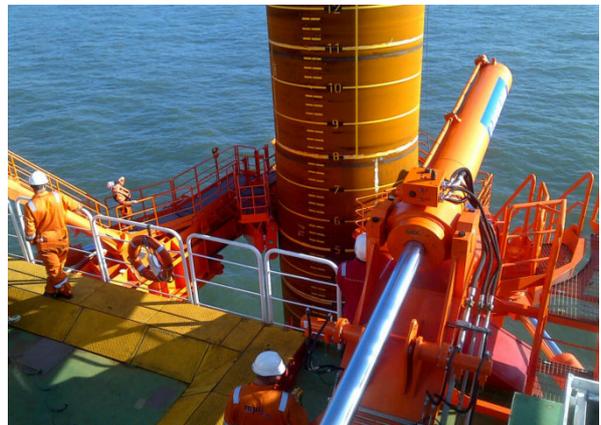
To be able to develop a simulation and thereby replicate behaviour it is of course necessary to have models of the physical system elements. Since a large system can involve large, complex plant, chemical processes, hydraulic systems, electric drives, computer controls and programmable logic controllers or distributed control systems, the company selected needs to have not only traditional engineering expertise but also computer science, systems engineering and even AI skills.

4. Is Communication Straightforward?

Will the company providing the support communicate effectively highly technical issues to more general engineering teams so everybody can understand and consider the potential benefits and implications.

5. Is this a new installation or an upgrade?

If a new system is planned and the in-house team is to lead the project and coordinate the design and/or implementation, then they may require support on the modelling, simulation and the control design stage; with minor support at the implementation stage. A company supporting such an activity must therefore include engineers with a wide experience of suitable control methods. This may include advanced controls, but not necessarily. It is also essential these engineers have practical implementation experience well beyond what educational establishments may for example provide.



**Applications of substance
(Wind turbine gripper arm)**

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6. Can you trust the judgement on the best design methods to use?

Companies based on one equipment supplier will obviously try to solve your problem within the constraints of what the equipment can achieve, and there is an issue of getting “best advice”. There may be features the supplier’s equipment does not contain and some problems that really need a tailored solution. In this case, a more general control design consultancy can help since it will not be tied to particular hardware or software vendors. It is like the choice of the best car. A Range Rover Evoque can do most things but is not good for Formula 1. The same applies to control engineering: There are just some situations where the problem is so particular, the habitual approach is not suitable and a tailored solution not constrained by design method, or by equipment supplier, is needed.

7. Does the control design method affect performance?

Some control solutions like PID are very reliable for many processes but they are extremely limited when it comes to achieving high performance. They cannot deal with multivariable systems and constraints on actuators and they just do not have a sufficiently high-order – level of sophistication in other words – to be able to shape frequency responses when performance is at a premium. Advice should therefore be sought from companies that have advanced multivariable control expertise.

8. How can you ensure designs are realistic?

The control engineering literature is dominated by the mathematics of advanced control systems with limited discussion on the problems of implementation and use. A more pragmatic approach is often needed. A good rule of thumb is the best control system is the simplest that can satisfy the performance requirements. Mathematical dexterity and abstract mathematical tools may be interesting but are not to be admired at midnight when the process has shut down. Support should therefore be obtained from a company with real applications experience.

9. Is technology transfer from another context potentially desirable?

For some situations, considerable insight and knowledge in a particular business sector is very desirable since problems may have been met before. However, in other cases, companies have tried the usual control solutions without solving the problem. In this case, a company that works across business sectors and can therefore bring new ideas and other perspectives to the table may have that elusive solution.

Contact ISC to discuss how we can help you with your control challenges.



**Hands-On Design Studies
(Course for Boeing, Seattle)**