

Flow Bench questions and answers:

1. Are we to quote for supply of oil for FAT or will you free issue for use in your system ? **Yes, you need to quote skydrol for the FAT. Red oil sub-rig will be checked during SAT only.**
2. Is it your intention for the Red Oil power pack at UTC Claverham to be shipped to Comar to carry out the FAT testing, if this is the case do we include for transporting this unit to UTC Poland ? **No. Power pack for red oil will be in our facility. If you need, you can visit us and get knowledge about this unit (after supplier selection).**
3. It mentions in 4.1 page 15 “HSW will provide all technical documentation to design and manufacture all features in p.3.1 ? Does this mean that the existing red oil power unit may require modification to allow it to meet the specification requirements ? **No. You have to design and implement the system to cool and heat the red oil which will be supplied by our power pack. You don’t have to modify power pack. If it is needed, we can send you technical data after delivery power pack to our site.**
4. Currently we have no information on the Red Oil power pack to integrate into our control system ? **No, you don’t integrate the power pack with test rig control system. Power pack has its own control module to setting up parameters (eg. pressure).**
5. Is the skydrol system requirements 170 lpm @ 350 bar ie an input power of 110 Kw ? **No. You need to achieve 170 lpm @ 350 bar and choose the best equipment.**
6. During testing Page 20 – RIG STOP MODE – does not say stop hydraulic power unit, I would have thought this would occur if an Emergency stop condition was activated. Maybe guards open cut power to the solenoids & E-stop stops everything ? **Yes, you are right. E-stop should stops everything, including hydraulic power. Doors open should cut the electrical power and the hydraulic power on the test rig (solenoid valves on the inlet to the rig).**
7. Page 20 – Guards not to be opened when in safe operating mode – I thought you wanted the guards open when running at low pressure? **Yes, correct.**
8. Page 23 - Are the instruments listed for each rig is this the total requirement? **Total.**
9. Flow Meters calibrated to – 60 Centigrade, this is a problem and we can only calibrate to – 40 C is this acceptable. We will use flow meters with PTFE seals

which make them compatible for use on either fluid as a spare item . Ok, we agree for calibration up to -40 C.

10. Please supply typical Moog servo valve part numbers to be tested on this bench. On this test rig will be tested various units. To achieve tests requirements it could be necessary to use servo valves in the control system.
11. Spec 1.1 What does „carrying out the test simultaneously at each sub-rig“ exactly mean? Will identical tests to be carried out on both rigs synchronously (dependent on each other) or should both sub-rigs be generally applicable at the same time? Both sub-rigs be applicable at the same time. Different tests will be performed independently in the same time. For some tests we would like to use both power packs to perform one test (one control system).
12. Spec 1.1 Anticipated dimension of thermal enclosure? Thermal enclosure to achieve high ambient temperature is in HS Wrocław responsibility. You have to provide the table and we will configure enclosure on the table.
13. Are any means necessary for UUT handling (e.g. crane)? No. UUT are light.
14. Spec 4.1 What kind of external interface (analog or digital) is required? It means to have control panel for power pack which is located outside of the power pack cover / acoustic insulation. Control panel for the power pack does not to be connected with test rig control system.
15. Module for multi-levels preparation of control signals.
 - Please give us some additional information to this point. We don't know your exact requirement.
We would like to have possibility to program our test configuration. As multi-levels preparation we mean that first is setting up parameters for control signals, then build it in test sequence, then in a one test and then setting number of repeating. Steps in this configuration can be little different – it is only estimation.
16. Control system shall provide connection of both towers in one control system to carry out one test.
 - There are two separate control systems for each sub rig. Should these two control systems connected together and one of them controls both sub rigs at the same time?
Control towers should have possibility to be connected in one network and then we can communicate with them. In some tests we have to use both fluids and we want to control this kind of test from one control tower.
17. Since xxxxx has wide experience with low temperature applications we are a bit concerned about the specified fluid temperature range. At the lower end of the range we expect difficulties in conjunction with hydraulic conveyance, guaranteed component ruggedness, etc. The stated accuracies could also be problematic in

connection with the extreme boundary conditions values. Is there a preferred way to fix this in the technical proposal? For reasons of seriosity, we would suggest limiting the points in detail.

We are aware of difficulties with accuracy on low temperature and some deviation below minus 40 degrees are acceptable.

- 18.** We cannot dynamically control the temperature of the fluids at 170 lpm or 45 lpm red oil so tests would be done over a limited amount of fluid displacement is fluid conditioned in a chamber!

A) are we to include for chamber

B) what quantity of fluid did they have in mind ?

Red oil power pack will be provided by HS Wrocław. You have to design and implement the system to cool and heat the red oil which will be supplied by our power pack. We don't understand exactly what you mean "chamber". If the chamber which will be around the UUT to sustain required high or low ambient temperature, it is also in HS Wrocław responsibility. We will build dedicated thermal chamber for each test.

Quantity of fluid – you have to choose the reservoir volume to achieve required flow rate.