



UNIVERSITY OF SYDNEY
Faculty of Engineering
ENGG1803 Professional Engineering 1



Liquid Gold

Introduction

Water is one of the most abundant substances on earth. Despite this, in some communities, potable water may be unavailable or in very short supply. It may be said that clean water is like liquid gold; like life itself.

This competition challenges participants to assist in conserving precious water by devising novel ways of measuring a specific quantity.

The Challenge

You are to devise and build an economical system that will quickly and accurately dispense a mass of 2000g of water automatically into a receiver vessel. Your object is to produce the most accurate, efficient and cost-effective solution in accordance with the rules and as determined by the formula below.

Competition Setup

The test setup is shown in Fig. 1. The test entry is to be supported on a 1500mm x 600mm table whose surface is 700mm above the ground. An elevated reservoir will deliver water by gravity vertically downward through a 25mm OD PVC tube. The Outlet Tube will be located over the centre of the table and 400mm above its surface. The water level in the reservoir at the start of the test will be approximately 1m above the table surface. The water flow will be controlled by a ¼ turn ball valve which will be either fully open or shut. A 4 litre receiver vessel will be supplied.

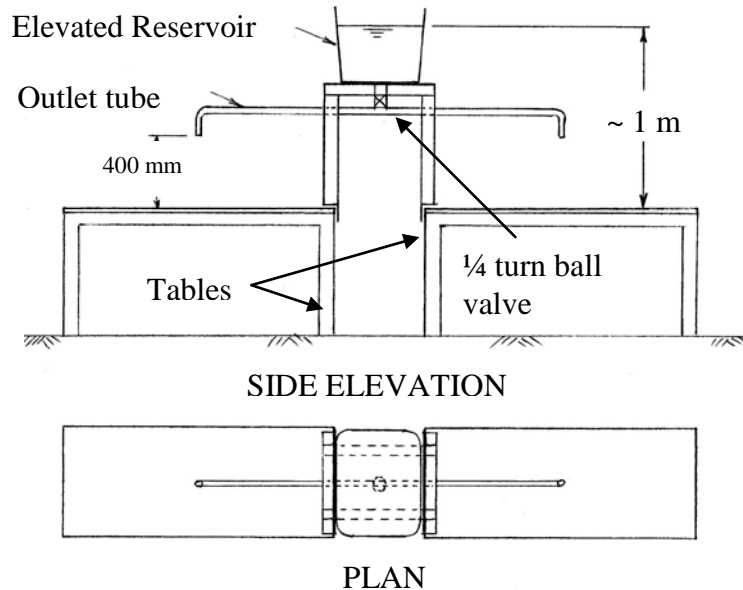


Fig. 1 Two identical test setups back to back

Competition Rules

1. An installation time, that must not exceed thirty seconds, will be allowed to position the test entry. Once installed, the entry or test setup must not be touched in any way by the entrants. Clear access will only be available to three sides of the table.
2. No part of the entry may touch the reservoir Outlet Tube.
3. The 4 litre receiver vessel may be positioned as desired but should be visible to all spectators. It must not have any part of the entry touching it during the test.
4. Once installed, the operation of the test entry must be fully automatic without any form of intervention or control on the part of the entrants.
5. At the commencement of the test, the entry must not contain any water or other liquid.
6. At the end of the installation period the elevated reservoir outlet valve will be opened and water will flow for 30 seconds. This 30 seconds is the “Run Period”.
7. The flow of water into the receiver vessel must have ceased before the end of the Run Period.

8. All water, other than that measured, must be returned to the water source used for filling the elevated reservoir rather than be allowed to spill on the ground. This water may be collected for disposal after the test or run through some form of drain.
9. An entry must comply strictly with these rules and at least one litre of water must be delivered to the water receiver vessel for the entry to be eligible for the prizemoney.
10. Entries **may** be tested in pairs. The ten best entries will then compete in a final.
11. The prizes will be awarded to the most cost-effective entries as determined during the final on the basis of the formula below.
12. The organisers' decisions will be final.

The Objective Function

The object of the competition is to minimise the objective function CE.

$$\underline{CE} = \$C \times \Delta M$$

- CE, is a measure of the cost-effectiveness of your solution.
- ΔM is the absolute value of the difference of the mass M retained from 2000 grams (i.e. $|M - 2000|$)
- Cost, $\$C$, of all components forming your entry (as evidenced by receipts, or evidence of the replacement-as-new purchase price of any components derived from other sources). Found objects are to be treated as bought items.

Test Details and Location

The test date will be Tuesday 27 October 2009 (**Week 13**). The test period, including finals, will be from 10.00 am to 1.00pm.

In the event of heavy rain the testing will be deferred to take place on Thursday 29 October 2009 (**Week 13**).

Unless otherwise advised, the competition will take place in Eastern Avenue near the City Road Footbridge.

Prizes

You will be competing for total prize money of \$1900 donated by our sponsor, GHD Consulting Engineers. This prize money comprises \$1000 for first prize, \$600 for second prize and \$300 for third prize.

Assessment

There are four components of the project work that will form part of your final assessment in this unit of study. They are:

- Initial Written Report on your project plan, your proposed solution and methods of analysis used. (You may include a brief Confidential Report giving more detail about your equipment proposed for use in the competition) to be submitted on Tuesday 8 September 2009 OR Thursday 10 September 2009 after the presentation (10%) (**Week 7**)
- Oral presentation on Tuesday 8 September 2009 OR Thursday 10 September 2009 based on the subject matter of your Initial Report (10%) (**Week 7**)
- Project Performance will be based on a prototype trial (**Week 9**) (5%) and the final test result (**Week 13**) (10%)
- Final Report to be submitted not later than 4.00pm on Thursday 29 October 2009 (15%) (**Week 13**) (along with the individual Peer Evaluation sheet in a sealed envelope)

Reporting

- **Your Initial Written Report on “Liquid Gold”** will form the basis for the oral presentation. A brief written confidential report, with drawings, on the equipment and method proposed for use in the competition is to be included, **but need not be revealed in detail in the oral presentation.** There will be no obligation for the group to stay with this proposed equipment if it is subsequently decided that a better solution is possible.
- You should submit a copy of your **Cost Assessment with supporting receipts or documentation**, signed off by your tutor, on Thursday 22 October 2009 (**Week 12**). You should keep a copy of this cost assessment that must be included also in your final report.
- Your **Final Report** will describe, with engineering drawings, your group’s entry in the competition. It should be as brief as you can make it and still convey all aspects of your group’s effort including planning, construction, preliminary testing etc. The report should be ready in draft form on the day of testing, to be augmented with details of the group’s final result and with a brief commentary on the results achieved by all other groups.
As part of your **Final Report** you should prepare a two-page electronic document illustrating your entry suitable for posting on the web. The top ten entries will be invited to submit this to me following the competition.
- A confidential **Peer Evaluation of Group Members**, on the sheet provided, assessing the contribution of all members of the team (excluding yourself) to the total project result. You should be conscious of the value of contributions that are either:

- 1.technical in nature, 2.organizational, managerial or leadership,
3. preparation for oral presentation, 4. preparation of the final report.

Tutors

Your usual tutors will be available to help you with any discussion. You may consult as widely as you wish.. This is your project and you will be encouraged to take the lead and be as self-sufficient a team as you can manage.



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Acknowledgement

The assistance of Dr Wayne Davies of SN2 Pty Ltd in conceiving this competition and formulating the conditions and rules is gratefully acknowledged.

R.J.Wheen
Associate Professor in Civil Engineering
6/8/09

UNIVERSITY OF SYDNEY

ENGG1803 – PROFESSIONAL ENGINEERING - 2009

“Liquid Gold” Competition

ENTRY FORM (one only per group)

(Submit to tutor not later than end of tutorial session on Thursday 13 August 2009)

We have read the competition conditions and agree to accept these and the decision of the organisers should any dispute arise. We declare that we are undergraduate students at the University of Sydney enrolled in the Unit of Study ENGG1803 Professional Engineering 1.

TEAM NAME _____

	<u>NAMES OF ENTRANTS</u>	<u>SID</u>	<u>SIGNATURE</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____