Covey Consulting News

June 2011

Recognition (again) for Covey Consulting

As Covey has done every year for the past 20 years, we took space in the Appita 2011 Exhibition area to promote our services. This year our theme was **"out of This World"** making the proposition that working with Covey had many extra benefits, including an out-of-this-world experience, while we shot-for-the-stars on the client's behalf. So we had pictures of planets, stars and comets and well as images of Covey astronauts prepared to travel anywhere to service our customers.

As with all exhibitors we were looking for that different approach to attract the passing foot traffic enough to stop, look and pause for a chat with our staff manning the exhibit. And that we succeeded in doing. We had a lot of interest, ranging from the impossible – How much to deliver that asteroid? to more earthly and achievable project work.

Chairman Geoff Covey, fellow Director Gerke Faber, Nafty Vanderhoek, Ross Patterson and Bruce Allender represented Covey Consulting at the Conference and Exhibition. Although we were not always dressed in our space suits, the overall Covey exhibition space was well patronized, and Covey Consulting was well represented in the main conference sessions, not only presenting several papers but also chairing several sessions. Nafty Vanderhoek had the additional responsibility (with two other experts) in presenting to and assessing the work of students in the Appita Wet End Chemistry Course, that was run concurrently with the Conference.

The overall exhibition space at Appita 2011 was well supported by company exhibits, all very professionally presented in an excellent exhibition area. Morning and afternoon teas as well as lunch were provided in the area. Also the industry innovation sessions were held in an open section of the same space. As a result exhibitors were pleased with the flow of conference participants through the exhibition.

As newsletter readers will recollect, Covey Consulting was delighted to be awarded the best exhibitor's award at the Appita 2010 Conference in Melbourne. We had no such expectation at the 2011 conference (although we certainly gave it our best shot) and indeed another company deservedly took out the award.

However an unexpected highlight for Covey at the Conference opening cocktail function was the presentation to the Chairman of a special recognition award from Appita acknowledging the 20 uninterrupted years that Covey has been an exhibitor at the Conference.

The award was a clock (shown) which now has pride of place in our East Kew head office where it will remain set on Kiwi time.

ALSO IN THIS EDITION

The Covey Notebook

Items of interest from Covey Consulting

Covey Consulting News

Appita 2011

The 2011 Conference was another big event for Covey Consulting.

We not only have the clock to display but some special photo images of the conference.

As usual Covey Consulting made a number of presentations at the Conference, all of which were well received. We expect some or all of these papers will be published in Appita T.I.M.E in due course.

Preparing for commissioning
G Covey, R Harvey, G Faber, D Shore

(Bio) Products from old Pulp and Paper Mills
B Allender

Eucalypt chip thickness pulping study
P de Morton, M Philipp, N Vanderhoek, K White

Linerboard quality revisited - Part 1: Combining theory with practice
R J Allan , P de Morton, N Vanderhoek

We expect these papers will be published by Appita in due course but get in touch with Covey Consulting if you would like to discuss any aspects of these presentations.

Covey Consulting is of course very proud of its recognition from Appita for being a continuous exhibitor for 20 years and its award for the best exhibition last year. But did you know that Covey Consulting also was the recipient of the award at the very first conference at which it exhibited.

Radiata Bulletin™ — 2 December 2010 — A Covey Consulting Publication

Tas forestry package

In this issue:
- Tas Forestry package
- Aus carbon farming
- Vic native logging
- More mill closures
- SA forest sale
- Scion core purpose
- NZ carbon Counting
- FEA wins time
- ANZ timber awards

Australia's Federal Government announced a A$22.4 million assistance package for Tasmania's forestry industry. A$17 million will be available for contracting and cartage businesses to leave the industry and A$5.4 million to help viable businesses remain viable. The announcement follows through on a promise by Prime Minister Gillard in July of emergency survival money for the industry. Some estimates indicate that up to two thirds of the 90 or so contractors involved in native forest logging may want to leave. Federal Forestry Minister, Joe Ludwig, said the exit grants were capped at A$750,000 per business. Applications will close on 13 December. The assistance package will not be available to sawmills or contract employees. The scope of the package was criticized by the Forestry Industries Association of Tasmania with spokesman Julian Amos believing it should be made available to other sectors of the industry. "I think there are a range of people within the industry who are not in the haulage sector who are also concerned about their ongoing welfare and livelihood, especially those in the silviculture and plantation development area," he said. Australian Greens leader, Bob Brown, said the package was too generous for an industry that received subsidies for over a decade. Tasmanian Premier, David Bartlett, said there were still many large and challenging issues in the forestry sector, but the package would provide some assistance to some in the industry.

"...there are a range of people... concerned about their ongoing welfare and livelihood..."

For for information go to www.coveyconsulting.com.au/radiata

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memo—Please contact John Trewick to learn more about our authoritative publication—Radiata Bulletin

A TALE OF TWO COINS

Among his many accomplishments, Covey Consulting's Chairman, Geoff Covey is a keen student of English history, particularly that which requires the painstaking research for which Geoff is well known.

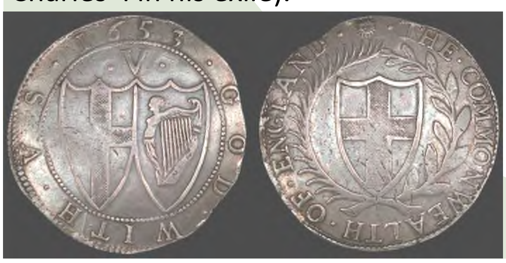
In 1649 King Charles I was executed and England became a republic (of the one party sort) called the Commonwealth. It soon started minting coins – with the legend in English and a very uninspiring design (see photo below). These coins were commonly referred to as 'breeches money' because of the appearance of the double shields.

As with so many republics formed by revolution, it was short lived and one of its leaders (Oliver Cromwell) soon set himself up as dictator (he called it Protector) but issued very few coins in his own name.

After Cromwell's death he was briefly replaced by his son Richard (known as 'Tumble-down Dick') but he had neither the desire nor the competence to be a dictator and in 1660 Charles' son (a friend of Nell Gwyn) became Charles II.

A lot of reform was required, including the coinage. On Charles's accession the coinage was in a poor state & much of it was the now politically incorrect Commonwealth Coinage.

At first the new designs were prepared by Thomas Simon, who had been engraver under the Commonwealth and Cromwell and retained his post under the restoration. However there was a lot of work to be done and the Flemish engraver Jan Roettier was called in to work with Simon (Roettier's father had assisted Charles I in his exile).



Not surprisingly, the two men found it hard to work together supposedly sharing the position of chief engraver. There are various versions of what happened next, but I propose to do what a journalist would never do and to pick the most sensational of the versions.

Both engravers produced their own designs for a new milled (machine made) coinage. Those of Roettier were preferred and he was given the task of preparing the dies for the issued coinage. His Crown (five shilling) design is shown below.

Roettier's pattern which was adopted for the coinage.

Simon attempted to have the decision reversed and produced a new pattern shown below which became known as the petition crown because of the lettering around the edge.

THOMAS SIMON MOST HVMBLY PRAYS YOVR MAJESTY TO COMPARE THIS HIS TRYALL PIECE WITH THE DVTCH AND IF MORE TRVLY DRAWN & EMBOSS'D MORE GRACE; FVLLY ORDER'D AND MORE ACCURATELY ENGRAVEN TO RELIEVE HIM

Simon's unsuccessful 'petition crown'

The edge inscription was in two rows of lettering – quite impressive for a coin only 3.5mm thick.

Simon also produced versions with plain edges and with the edge inscription *RENDER UNTO CAESAR THAT WHICH IS CAESARS* (in English and Latin versions).

Simon's petition was unsuccessful and Roettier's design was retained. Many regard Simon's design as one of the finest ever produced and put the decision to reject it down to favouritism. Personally, I find little to choose between the designs, and if all of the work the two engravers is considered think that Roettier may have just had the edge.

The result was that Roettier became chief engraver and was responsible for most of the larger coins (sixpence and up) together with most official medals, and Simon produced only the minor coins.

The conflict did not last long as Simon apparently died in the Great Plague of 1665, Roettier continued to design coins and medals until the 1690's and Peyps described his medals as "some of the finest pieces of work, in embossed work, that I ever did see in my life" (*Diary*, 26 March 1666).

Now to spoil a good story: Roettier's design of crown was in 'mass production' in 1662 – but the Petition Crown was not produced until 1663 and according to at least one source, Simon was in France at the time of the original 'competition' and his effort at this time was rather hurried and inferior.

Only about a dozen petition crowns remain, with just three in private hands. Roettier's issued crown is fairly common (Geoff reports that he had one in his collection until it was stolen a couple of years ago). Both are beautiful coins, but surely readers must decide which they prefer.

HEDGING MY BETS

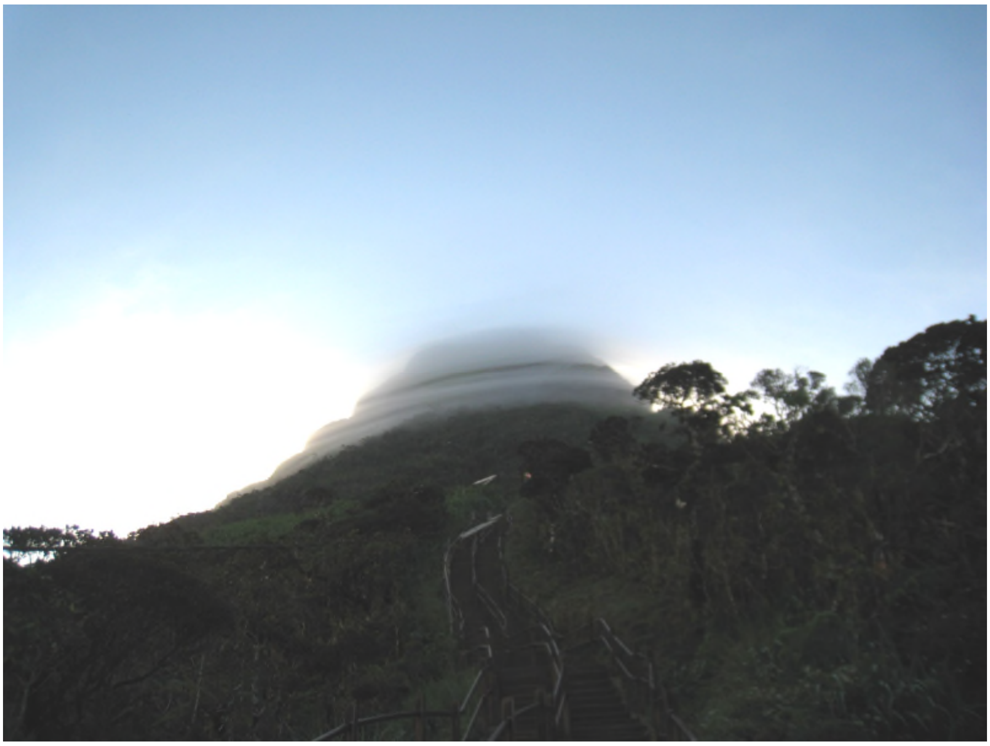
In earlier editions of the Covey Newsletter Covey stalwart (St.) Bruce Allender described a spiritual pilgrimage in Spain (well it turned out that way) following in the footsteps of Christian pilgrims through the centuries to worship the bones of St James the Greater in Santiago de Compostella – and who hoped thereby to get a better deal in heaven. Bruce now may or may not have some brownie points for the future but the experience will stay with him forever.

Everywhere there are opportunities to be a pilgrim – it is a serious personal business and not just for the benefit of tourist companies, cathedrals and temples. And not just for Christian religions. Buddhism is another which has its fair share of pilgrim worthy sites, and inadvertently I have just completed another pilgrimage to one of their most sacred sites in Sri Lanka.

Sri Lankans are predominately Buddhist. In fact (in religious terms) Buddha himself visited the country, and on one occasion left an indentation of his left foot in the rock at the top of a now sacred mountain.

This is a multipurpose footprint with Hindus saying the foot print is that of the deity Shiva, while Muslims and Christians suspect it is the footprint of the exiled Adam (Sri Lanka being a possible location of the Garden of Eden). From my recent experience I would say the Buddhists are primarily running the show.

For me, Adam's Peak started as simply one stop on a quick tour of Sri Lanka with the option of an easy hike up the mountain to catch the dawn. Right. A tourist stop is one thing, but to appreciate the significance of the mountain in the lives of Sri Lankan Buddhists is a very



different proposition. Just like the Spanish walk, for the locals the climb has karmic benefits for their future incarnations.

The name Adam's Peak is a colonial confection (Portuguese/Dutch/English), the locals using other older names such as Sri Pada ("the sacred foot") and Butterfly Mountain (in Sinhalese). While not the tallest mountain in Sri Lanka, it is the tallest stand-alone peak some 2,243m above the base.

It all seemed so straight forward, concrete steps with eateries, drinkeries and dunnies (more or less) all the way to the top. And we had a guide, Dharma, a wonderful gentle man with lots of good karma who had done the walk many times.

A 2.30am start (pilgrims need to be up there for the dawn) and we join the throng. Reputedly tens of thousands take the walk each weekend during peak pilgrim season. There were enough this weekday. This is no tourist trap for foreigners, but a serious pilgrimage that Buddhists want to make more than once. Sri Lankans in general are not big into walking and hiking (30C and 90% humidity is a downer), but when it comes a pilgrimage, it just has to be done. Although the next generation of well fed and face-booked children are proving more resistant to the idea.

Looking at the line of dancing fairy lights illuminating the trail all the way up, starting is easy. But soon…..this is getting a bit hard; let's stop for a drink.

And as the steps get steeper and narrower, you are surrounded by pilgrims all pushing the same way. Some slow, stopping every few steps, some carrying children, but all moving inexorably upwards.

By this time I am desperately dragging myself up by the stair railing but with each bend in the trail it gets steeper.

Above the cloud line now, but dripping wet entirely due to sweat. This is really very hard work.

Finally, finally after four hours, I reached the top, packed with people and Dharma barely raising a sweat.

Many folks walk up the previous afternoon and sleep in the top temple so it is standing and lying room only. It is pretty chilly too, so the locals are decked out in woollies, scarves and beanies (weird to see such items for sale at the tropical bottom of the mountain) never to be worn again in Sri Lanka.

But back to the serious stuff. I join the barefoot shuffling queue to have one's head bowed by the monk in the grotto that contains the sacred footprint. And indeed there is a broad foot print outline under the brocade and money.

Then onto the shrine containing a very ancient and very sacred wood carving of the Buddha to have another monk daub ochre on your forehead, and you take a single clang of the bell to signify your achievement. But those are just the basic rites. The other Buddhist rituals going on around as dawn breaks remain a complete mystery and a reminder of the so many other levels of understanding in this faith.

At 6 am the temple drums signify our required exit from the temple area, and then the long haul down the steps – by a route at the back of the mountain this time to see the triangular morning shadow cast by the mountain on the landscape (no apparent religious significance, but still impressive). Even more impressive was looking back and seeing a halo of cloud around the mountain top – apparently a very rare occurrence, and spiritual indeed came to mind. A further tough three and a half hours later we are back into the steamy tropics in time for brunch.

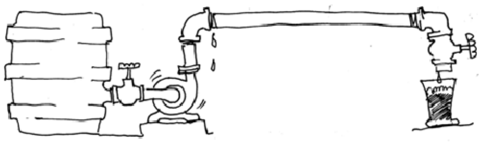
Dharma (you remember our guide), a devote Buddhist, has now made this pilgrimage over 1200 times, so he must be in good shape for his next life. And certainly watching him literally glide up the steps in an increasing state of bliss the closer we got to the top, I am sure there is something to it.

While this was a superficial way to address my karma and my next life, I am hoping for the best, especially if the effort involved counts for anything.

How to pump beer

At last, a really useful technical article. The reader may not actually want to know how to pump beer but for many of our readers it is absolutely essential that "someone" knows how to do it.

Ross Patterson explains how (& also demonstrates his artistic talent)!



A good friend of mine has a degree in Chemistry, which is of course a useful trade. But not long ago I found him wading through a copy of the "Crane Manual" working on a pipe flow calculation. You have to wonder: "If his toilet was blocked, would he call in a plumber?" I guess I have a tradesman's distain of DIY manuals like "Domestic Plumbing for Chemical graduates". And the boss was looking for a technical contribution, so..

But this little story is not intended to be a lecture on fluid dynamics. It hopefully puts some flesh around a few concepts, & points out some pitfalls. There are plenty of good texts which cover this field, & some pretty ordinary ones as well. Blevins is by far the best I have come across if you can locate a copy. [Blevins, Robert D Applied Fluid Dynamics Handbook 1984 Van Nostrand Reinhold].

Units

The world of engineering should be catalogued AM and PM; as in, before and after the SI system was adopted. Our American cousins are still in the dark ages where "If the sun is in the west, to divide by '**g**' is best". The change was made while I was completing final year Engineering. Now there is an embarrassing admission!

Blaise Pascal was a French scientist and philosopher, whom I deeply admire. But the French insist on using horrid concepts like kg/cm^2 for pressure! That's the French for you. ("We know truth not only by reason but also by the heart"- Pascal. How true and how French).

Can I suggest you never use an equation that has been fiddled so that the consistency of the units can't be easily confirmed. It's like tampering with the auto-pilot in an aeroplane. I like to be in charge of my own destiny, thank you.

Beer and other stuff

We are talking here about *Newtonian Fluids*. These have a common and predictable behaviour based on viscosity. The *Navier-Stokes equations* (think CFD) revolve around this assumption. Apparently tomato sauce is non-Newtonian, which is why it spurts uncontrollably out of the bottle. Pulp flow is also non-Newtonian. I'm not sure about beer. And please, let's just avoid mixtures of solids, gases, and or liquids. Way too hard.

We are talking here about incompressible flow, which means that the density is constant. This is an excellent approximation in most cases, even for gas flows. I have analysed long steam pipe runs with significant pressure drops, by treating the pipe as several sections each of approximately constant pressure/density. A true compressible flow calculation is quite messy. (Translation: - "I don't know how to do it").

Boring stuff

Bernoulli (First Law) is simply a statement of energy conservation. It says that the total energy (potential) + (kinetic) + (thermal) is constant.

Potential energy flow is

$(\mathbf{P}*\mathbf{Q}^{dot})$

[watts]=[Pa]*[m^3/sec]

Noting that [N]=[kg]*[m/sec^2]

Kinetic Energy flow is

$(0.5*\boldsymbol{\rho}*\mathbf{v}^2)*(\mathbf{Q}^{dot})$

[kg/m^3]*[m/sec]^2*[m^3/sec]

Thermal energy is just

$\boldsymbol{\rho}*\mathbf{T}*\mathbf{C}_{v*}\mathbf{Q}^{dot}$

[kg/m^3]*[deg]*[J/kg deg]*[m^3/sec]

We are all familiar with the idea of reversible transfers between pressure and kinetic energy, which allow the birds to fly and the bees to buzz.

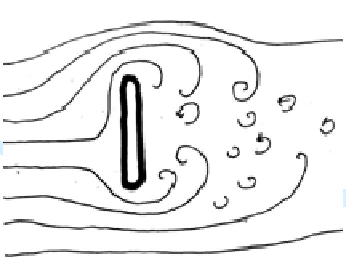
But now let's recognise the irreversible transfers from potential energy to thermal energy which happen in pipes. These are caused by friction at the walls, and various obstructions. The pipe velocity has to stay fixed, so any loss of energy to heat has to appear as a pressure drop. That is what "pipe losses" are !

Bang !

Notice that only the potential energy has no "density" term? Odd? Think of the "bang" you get when a pressurised gas bottle explodes, and compare this with the "pop" you get from a bottle of water. Store that thought away somewhere.

Velocity Pressure

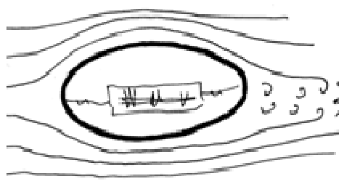
Put your hand out of the car window at 100kph. What you are feeling is called "velocity pressure". You are stopping the airflow; destroying all of the kinetic energy.



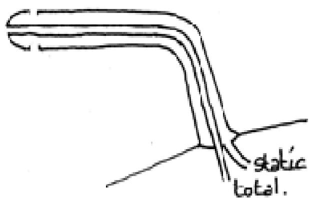
So that's the definition of velocity pressure: $\mathbf{P_v=0.5*\boldsymbol{\rho}*v^2}$

Let's say the area of you hand is $0.02m^2$, then the force you feel is $0.02*0.5*1.2*27.7^2$ which is about 10 Newtons (about a kilogram for Chemists).

This sum actually assumes that you leave a stagnant wake exactly the size of your hand. In fact the effective size of the wake is probably about 20% bigger. If you held out a football (which is pretty "streamlined") the wake is probably about 30% of the frontal area. So your hand would be said to have a "drag co-efficient ($\mathbf{C_d}$)" of 1.2 and the football around 0.3. The losses all relate directly to the kinetic energy, and hence the velocity pressure. That's how it works.

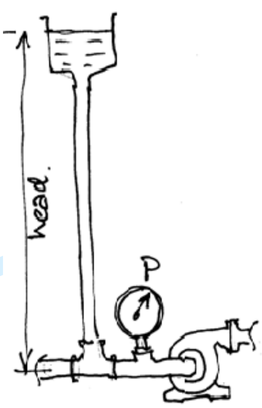


It is sometimes said that the velocity pressure ($\mathbf{P_v}$) plus the static pressure ($\mathbf{P_s}$) is the "total" pressure ($\mathbf{P_t}$). But this is just Bernoulli with fancy names. Check out the next Pitot tube you see; sticking out the front of an aeroplane maybe.



Head

Engineers tend to use "head" for liquids and "pressure" for gases. But it's quite ambidextrous really.



$P=\rho*g*h$

$[Pa]=[N/m^2] = [kg/m^3]*[m/sec^2]*[m]$

Pump curves are nearly always plotted as "head" Vs "flow". As a rule of thumb a head/flow curve works regardless of the fluid density. You can use it for beer or for petrol.

Pipe losses

Fluid flow in pipes suffers drag forces when flowing around elbows valves and other fittings. It is exactly the same concept as the drag coefficient C_v described above. The loss coefficients for pipe obstructions are called a "**k** values". For example when flowing around a commercial elbow the energy loss will be about 20% of the velocity head. Hence k=0.2

These k values are published in various texts, including Blevins.

The loss in these cases is eventually irreversible. The fluid heats up slightly, and the static pressure falls as a result. (The velocity can't change because its in a pipe).

Control valve manufacturers quote a horrible garbled **k** value which they call a **C_v.** It's the same thing but with mangled units. (Not to be confused with the real **C_v** - specific heat with no volume change).

Some texts also quote "equivalent lengths" instead of **k** values. In other words the loss in the elbow is equivalent to (say) 10 pipe diameters. This bugs me. There is no way they can be equivalent. Using "equivalent" lengths is inaccurate, and it is not any quicker.

The pipe flow also suffers drag from the pipe walls. This is dependant on the wall roughness, and stuff called Reynolds number effects. But this is getting a bit heavy. Hire a plumber.

"Skin Friction" on an aeroplane depends on the smoothness, and the form drag depends on the shape. Same concepts.

Bewares

Some manuals espouse short cut methods which assume that the flow is "fully developed turbulent". Now this is a best-case assumption and will underestimate the pipe friction; maybe by 100% or so. So my advice is to work out the Reynolds' number and do the sum properly.

And it's a good idea to get the internal diameter spot on. This number gets raised to the power four (+).

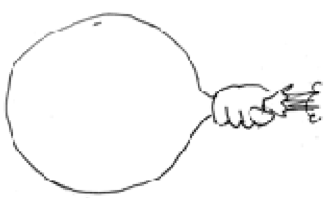
Gas flow Hot and cold duct flow, as well as steam, compressed air and gasses get thoroughly messed around in some "Pipe Flow for Dummies" manuals.

For heaven's sake, they are just Newtonian fluids. The sums are identical to beer, provided you don't get involved in compressibility effects. If the pressure drop is less than say 10% of the average absolute pressure, you are probably pretty safe.

But these manuals introduce pernicious concepts like "Acfm", "Scfm" and the like. This is a cubic foot that has been removed from the pipe and cooled or de-pressurised to ambient (standard) conditions. This is really just a statement of inlet mass flow and has no other sensible use. (I apologise for the American units; quite common in compressed air manuals).

Find out what the actual density and viscosity are inside the duct, and work on this basis. Typical gas velocities in pipes and ducts are normally in the range 5 to 15m/sec depending on the application. Sonic velocity is around 330 m/sec for air at room temperature.

"Choked Flow" is an important idea,



but probably this is not the time or the place.

An interesting challenge is to convert a typical fan curve at standard inlet temperature and pressure so that you can use it at different temperatures (or whatever). But this can be tricky. Call a plumber..

Dimensional magic

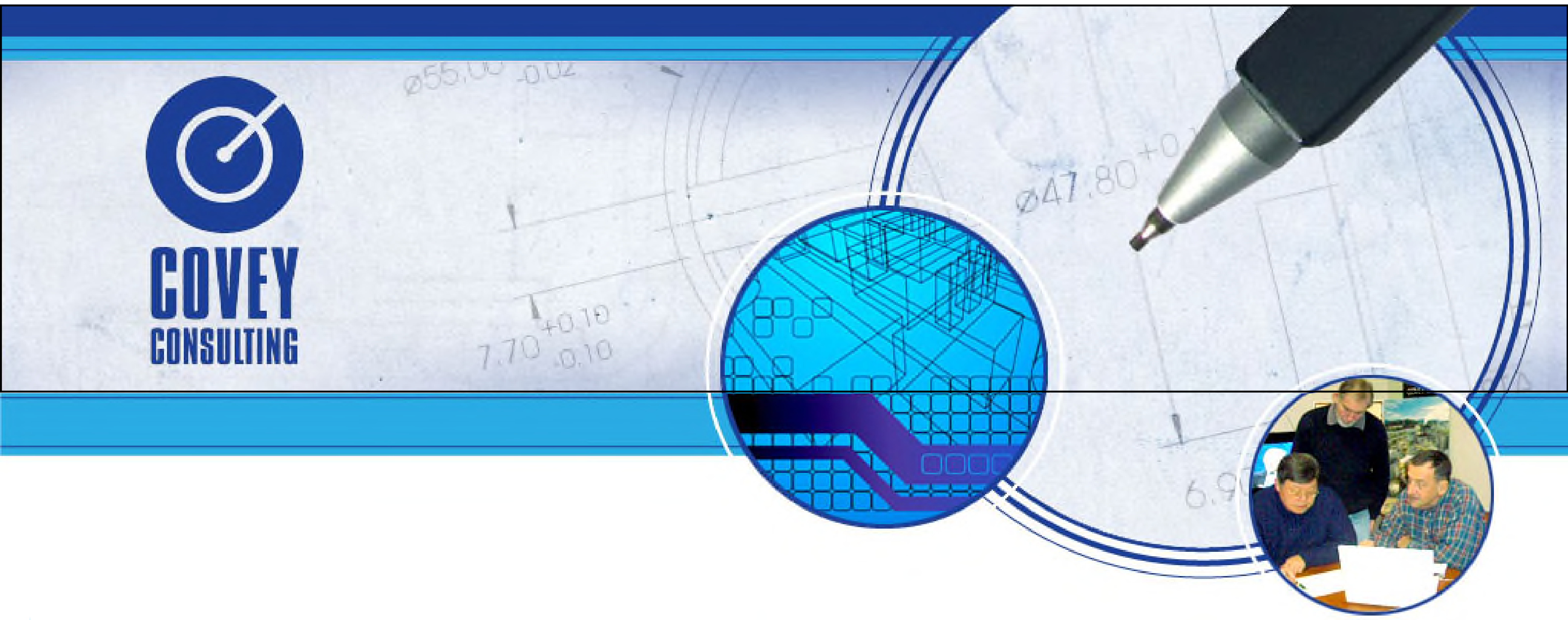
The manuals often include a little section on "Fan Laws" or "Pump Laws". These are really not *laws* at all, but the idea is this:- "We have a pump running at 1400rpm, and giving 100m^3/hr at 15 meters head, drawing 17kW. What will happen if we speed it up 10% ".

The "law" says that the flow will increase by 1.1, the head by 1.1^2, and the power will increase by 1.1^3. And it's sometimes not a bad first pass, particularly if the change is small. But this is very much swing-and-giggle golf.

Dimensional analysis of "Incompressible Flow Machines" is a study in its own right. Why do ships have propellers and not paddles? Why do elephants have big feet? Why do pendulums swing at **$\sqrt{L}$** ? It's all dimensional magic. The fact that Head/Flow charts for pumps work reasonably well for various fluids regardless of density, is one simple outcome. But..

Enough said

Hopefully this was mildly entertaining, even if not necessarily useful. If you care to email Ross Patterson at Covey Consulting he would be happy to share a simple spreadsheet which does viscous flow calculations, and also covers the TAPPI (Duffy) stock flow method. Some care but absolutely NO responsibility.



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Mr. Gerke Faber	Engineering Manager
Mr. Reg Harvey	Process Manager
Mr. Dennis Shore	General Manager (Projects/Strategies/Markets)
Dr. Dennis Creasy	Chemical Engineer (Emeritus)
Mr. Roger Canty	Chemical Engineer
Dr. Ajit Ghosh	Chemical Engineer
Dr. Bruce Allender	Environmental, Microscopy & Procurement
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Mr. Norm Lasslett	Process & Control Engineer
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Covey Consulting has a close working relationship with a network of associates who can provide specialist knowledge outside our direct area of expertise. These include Civil and Structural Engineers, Chemical Analytical Laboratories and Technical Information Services.

Covey Consulting regularly uses the scientific resources and equipment located at the universities of Melbourne, Monash and RMIT as well as the CSIRO.

Let Covey Consulting connect all the pieces for you