

From the editor

Well this is quite a large edition of HUFF containing a much wider variety of material than we usually include. I am always in the lookout for material of this sort so if this sparks your interest please consider sending us some material if you too also become involved.

Timothy Smith - tas@ozhvp.org.au

Storing the HPV

Qn. We are putting our tandem away for the winter. Should I leave the disk brakes on (that is put velcro around them as 'parking brakes') or leave them off.

Ans. I'd suggest leaving the locks off the brakes so that the seals are in their relaxed position, and not squashed hard into the sides of the cylinders. I can't say I've had any real problem from leaving mine on my demo trikes for weeks at a time, but occasionally the levers don't seem to move as freely as they might.

Ian Sims - Greenspeed - ian@greenspeed.com.au

2005 Greenspeed OzHPV Challenge

The 2005 OzHPV Challenge was held in Broadford early in April. This year we had races on one day only which allowed more time for some social events and for interstate visitors to enjoy all the races. The Reg Hunt Park Track has recently been resurfaced and is now a very good smooth fast bitumen - but still lots of hills. Catering was again ably managed by the Broadford scout group and we had generous sponsorship from Mitchell Shire, Greenspeed, Stuty's Bakehouse, MR Components, Trisled, Typing 2000, the CMG group, Freedom HPV and Flying Furniture

For the challenge we had a fine warm day touching 30 degrees and the first event was the gut-busting hill climb. Competitors then stayed at the top of the hill for the start of the down hill roll. This "race" (no pedalling) was appreciated by all, as no effort was necessary or allowed, and it was over the fast big thrilling downhill on the track. Low racers did well, and Jamie Friday's fully faired bike won. Mick Webster rode a standard racing bike and came 9th. In the interest of science, Matt Ellison ran his Toyota Camry, (car) over the same downhill course as the bikes, with the result that it went about as far as the best of the bikes.

The off road was held on a bumpy course around the top of the camping area with obstacles including a dry riverbed, a hot dog van, a BMX jump between 2 trees and a rutted grassy area. David McCook won and Jamie Friday punctured while negotiating the riverbed and did not finish, which probably cost Jamie the first place in the Challenge.

The road race was most gruelling and really consisted of a series of long hillclimbs on the South side punctuated by long downhills on the North side. I rode my hybrid tandem bike with my son Ewan,

niece Josephine and nephew Fraser alternating as stokers. When they weren't riding, they were cheering the riders on, along with a small group of scouts. All the cheering was most appreciated.

The Challenge points races ended with the slalom and shopping races held on the tarmac underneath the race track control tower. There was a good audience for the events: Ewan Nurse took out the slalom beating Jamie Friday, and Jamie beat William Reid in the shopping race. Some of the lowracers proved impractical in the slalom with a few riders picking up their bikes and running to be competitive.





How to carry a HPV?

A fun relay race was held after the points event with a bike, recumbent bike, trike, junior and female competitor represented on each team. Teams were organised at short notice and the required competitors and vehicles obtained, swapped or cajoled. In the end Pete Heal, Matt Heal, Helen Curtis and Mister X (didn't catch all the names, sorry) won the race.

Just on dusk the presentations were made and "usual suspects" David McCook, Jamie Friday, Ian Humphries seemed to be winning almost of the certificates. But there were a few surprises at the end with John Finch coming third overall, Jamie Friday in second place and Ian Humphries first. Ewan Nurse won the Junior Section and Helen Curtis the Ladies.

The Trivia Night followed and Secretary Atholl Reid gave a brief speech about OzHPV. The night was great fun & is becoming an institution at the Broadford Event.

The Sunday of the Challenge was cold and windy but there was an enthusiastic crowd outside Stuties Bakehouse for the concourse. It's great to see innovation in HPV's continuing. Highlights included Ken Houghton's fork blade for improving stability and aerodynamics of disc front wheels, Jamie Friday's fairings, Damian's back to back tandem, and new trikes by Lloyd Charter, Daniel Dobrosak and John Finch.



After the concourse Damian Harkin and Peter Moeller visited the large car parts fair taking place just near Stuties. The Challenge ended for me when I escorted Jamie Friday as far as the Hume Highway turnoff. (Jamie rode all the way to Melbourne on one of the windiest days of the year.)

Damian's Family played a huge role in the running of the Challenge, Joan ran the Trivia Night, Claire was a most capable official and Sarah worked tirelessly on the data entry. Frances competed and came third in the women's section. Many thanks for your help. Thanks also to all who participated this year. May it be bigger and better next year!!

Steve Nurse - cesnur@iimetro.com.au



#	Name	Class	POINTS			TIME	ENDURO	ROAD	SLALOM	SHOP	Total	Place	Junior		Women		Men		Division
			HILL	ROLL	Overall							pts	place	pts	place	pts	place	Place	
1	Matt Elliston	MEN	26	30	30	18	25	30	28	187	36					187	25	25	
2	Ewan Nurse	JUNIOR	18	29	30	18	25	1	14	135	21	135	1					1	
3	Ray Lelkes	MEN	17	21	18	14	14	30	28	142	22					142	18	18	
4	Mick Webster	MEN	9	9	10	18	9	23	4	82	9					82	8	8	
5	Kerry Hansen	WOMEN	26	30	29	18	25	22	10	160	30			160	6			6	
6	Helen Curtis	WOMEN	5	8	9	7	6	13	12	60	6			60	1			1	
7	Rudolph Werner	MEN	20	17	22	15	24	10	9	117	14					117	13	13	
8	Alan Murchison	MEN	15	24	20	18	13	17	27	134	19					134	17	17	
9	Jon Finch	MEN	6	14	8	4	8	3	5	48	3					48	3	3	
10	David McCook	MEN	4	3	4	1	4	21	16	53	4					53	4	4	
11	Liam McCook	JUNIOR	24	22	28	13	21	14	21	143	23	143	2					2	
12	Atholl Reid	MEN	12	13	16	6	17	24	3	91	10					91	9	9	
13	Meg Warren	WOMEN	19	19	21	18	18	30	19	144	24			144	4			4	
14	Fraser Rowe	MEN	8	7	6	3	5	19	6	54	5					54	5	5	
15	Matt Heal	MEN	10	6	15	18	22	27	18	116	13					116	12	12	
16	Pete Heal	MEN	3	4	2	18	3	29	13	72	7					72	6	6	
17	Andrew Stewart	MEN	7	5	11	9	7	25	8	72	7					72	6	6	
18	Heather Safstrom	WOMEN	26	25	25	18	25	11	28	158	28			158	5			5	
19	Serena & Fraser Nurse	WOMEN	26	30	30	18	25	30	28	187	36			187	7			7	
20	Stephen & Josephine Nurse	MEN	16	26	19	5	16	28	11	121	15					121	14	14	
21	Nick Safstrom	MEN	26	30	30	18	25	30	28	187	36					187	25	25	
22	Daniel Dobrosak	MEN	14	10	17	8	15	26	22	112	12					112	11	11	
23	Cale Dobrosak	JUNIOR	22	28	26	17	20	9	26	148	25	148	3					3	
24	David Downing	MEN	26	23	30	18	25	7	23	152	27					152	20	20	
25	Ken Houghton	MEN	26	16	23	10	23	12	17	127	17					127	16	16	
26	Ian Humphries	MEN	1	2	3	2	1	4	7	20	1					20	1	1	
27	Bec Gibb	WOMEN	13	15	14	18	11	30	28	129	18			129	2			2	
28	Jamie Friday	MEN	2	1	1	18	2	2	1	27	2					27	2	2	
29	Peter Moller	MEN	21	27	24	18	25	16	20	158	28					158	21	21	
30	Frances Harkin	WOMEN	25	18	27	16	19	5	24	134	19			134	3			3	
31	Anthony Romanav	MEN	11	11	13	18	12	20	15	107	11					107	10	10	
32	William Reid	MEN	23	20	30	11	25	8	2	126	16					126	15	15	
33	John Kulgis	MEN	26	12	5	18	25	30	28	151	26					151	19	19	
34	Peter Mathews	MEN	26	30	12	18	10	30	28	161	31					161	22	22	
35	Braden Shankuar	JUNIOR	26	30	30	18	25	6	28	170	32	170	4					4	
36	Lloyd Charter	MEN	26	30	30	18	25	15	28	179	35					179	24	24	
37	Damian Harkin	MEN	26	30	30	18	25	30	28	194	39					194	27	27	

HPV World Record Attempt 1984

This is how I came to be sitting in on an attempt on the world human-powered speed record 21 years ago. It didn't work as such, but left an indelible impression on those who braved a chill early morning to watch those who tried.

The episode began in the spring of 1983. Having ignored an old injunction, 'Don't give up your day job', I quit a boring existence as a public servant for a somewhat haphazard living as a major correspondent for what were then the two major cycling magazines in the country, *Freewheeling*, based in Sydney, edited by Warren Salomon, and *National Cycling*, then based in Queanbeyan, edited by the late John Drummond.

It was the latter who asked me to look into an attempt being organised locally to break the Australian (and perhaps world) human-powered speed record. This, it seemed, was set in California (where else?) in 1980, at slightly over 90 k/mh.

The winning rider was given an honorary traffic citation by the California Highway Patrol, breaking what was then the national 55 mph (90 k/mh) speed limit.



Lachlan Thompson HPV and aeroshell, Dec 1983

I was initially at a loss. I knew virtually nothing about these strange beasts called HPVs. Luckily, I knew someone who did. I contacted an old friend, 'well known Melbourne cycling ratbag', as I once described him in a magazine article, Alan Parker, then of East Malvern. Alan happily let me access his voluminous files; I was soon immersed in a strange sea of drag co-efficients, incredibly high gear ratios, and the virtues of recumbents versus more or less conventional bicycles with teardrop fairings.

I found myself in contact with the designer of the vehicle itself, Lachlan Thompson, then of Bayswater, an aerospace engineering student at Melbourne's RMIT. He was a little chary at first of letting the cat out of the bag so to speak, but in due course just before Christmas 1983, agreed to an interview, and a look at the vehicle he designed. At this point, the photographic record, such as it ever was or will be now, started. Lachlan showed me the strange machine he was patiently building in his garage.

I'd seen a few recumbents and much of the bike was fairly conventional, apart from the massive gearing and joystick steering. The airframe was constructed out of lightweight composite timber material, light enough so that I could pick it up with one hand.

Without all the mathematics, Lachlan Thompson explained to me his conviction that frontal area was the key to a world record. Using advanced computer facilities at RMIT, he designed a vehicle with the minimum frontal area compatible with the requirements of recumbent and rider. If the area presented as wind resistance could be kept down, the vehicle should theoretically be able to reach record speeds. In practice, it turned out rather differently.

In its own way, all this was quite remarkable. That there was a world human-powered speed record had only been recognised and then challenged a few years before, yet an attempt was already being mounted here in Australia, and with a vehicle as sophisticated for its time as any elsewhere.

That was all I heard or saw for a few months. I was elsewhere doing other things, but put in an occasional call to see what was going on. As summer moved into autumn, the news got progressively better. Lachlan Thompson acquired a major sponsor in the form of General Motors Holden. This made possible several things. Apart from recruiting West Australian

champion racing rider Steele Bishop as pilot, it also opened the GMH testing circuit at Lang Lang, 70 km south-east of Melbourne, for a record attempt. The test track had a perfectly circular 5 km loop, with raised embankments like a huge velodrome, for the event. The key variable was now the weather. A record attempt required absolutely still air conditions, the HPV could be affected badly by any wind at all. The ideal time for this was early autumn, and the ideal time of day, dawn. I got a call in early May that an attempt would be made, weather permitting, on Tuesday morning the next week. I set the

alarm for a very early hour, much like a long ski trip.

Unfortunately, my situation for a magazine exclusive was far from ideal. *Freewheeling*, independently of my efforts, put out a major feature on Steele Bishop and the record attempt the previous month. Lachlan Thompson also impressed upon me that his sponsors were supposedly nervous about allowing any kind of media into where they tested their supposedly secret prototypes and test vehicles. Cameras were apparently prohibited in the workshops, though not on the track itself. I decided to take my camera in anyway, and the throwing open of the track to the media later in the day showed I was correct to do so.

I drove up to the test track gate in pre-dawn darkness, explaining to a security guard that I was here to cover the world record attempt for a cycling magazine. He looked at me sympathetically: another crazy cyclist, who of course drove a car, an old foreign one at that. Under the dash was a compact Olympus XA camera, with an excellent wide angle lens, manual over-ride on aperture and shutter speed, loaded with high speed 400ASA film, ideal for taking photos in poor lighting conditions.

I followed the other cars (there were a few people there) to the perimeter of the test circuit. The sky was slightly misty but otherwise clear, just beginning to lighten. There was no wind at

all. I climbed the embankment and walked across the empty track to the pit area. The HPV was already there, Lachlan Thompson had just arrived. I said hello to both Lachlan and Steele Bishop, both were too busy preparing for the event to talk to me.

The HPV had changed considerably since I had last seen it in December the previous year. The rear section of the transparent canopy was removable. A small pair of outrigger wheels with solid tyres had been added, with fibreglass fairings of their own, so that the vehicle was stable on the track. The cramped cockpit sprouted an awesome array of electronic monitoring devices.

Steele Bishop, dressed in racing gear, wedged himself into the tiny vehicle while technicians fussed over various equipment. The rear canopy was secured, the crew had a hurried final consultation and weather check. It was still calm, the sun was just catching the tops of the trees around the track. Lachlan gave



Steele Bishop consults Lachlan Thompson (right) after the failed dawn run

At that point, the worst happened for me personally. Instead of a smooth winding action, a small but horrible crunch came from my XA. Oh no. End of film. I thought I had two shots, not one. And I had the sick knowledge that photo labs often chopped off the last shot on my films. I knelt there, helpless, as all three vehicles roared past and were gone.

I had a spare film, wound the previous one off and reloaded. I walked back across the track to the pit area. The faces of the pit



HPV at Lang Lang, May 1984, with outrigger wheel on fire. Smoke trail is clearly visible, pace cars at left.

the pilot the thumbs-up, Steele Bishop started to apply power, and with a rumble of high-pressure tyres on bitumen, the HPV moved off, heading west, towards the sea, then looping back.

I figured that with time to build up speed over 5 km, I had a few minutes to get myself into a good photographic position. I considered the inside of the track near the pit area, where the official photo was taken from. I decided this was a bad position. If I looked up the track to where the HPV was coming from, I'd be looking straight into the sun. As it passed, I'd only get one chance to take the right shot. I headed to the outside of the track, perching myself against the armco barrier. I was comfortably further away from inquisitive GMH employees. I'd also see the HPV coming further off, with time for a head-on as well as a tracking shot if all went well.

Minutes went by in the early morning stillness. A faint rumbling announced that the pace cars were approaching from the east. I opened the lens cover and aimed the camera down the track. The morning sun was now about ten degrees above the horizon. The HPV came into my tiny view-finder. It was instantly obvious something had gone horribly wrong: like watching a World War II fighter combat movie. As it roared towards me, the HPV laid a neat trail of bluish smoke around the track behind it in a perfect circle. I clicked the shutter, started swinging right and winding the film for the flank shot.



Technician checking instrumentation inside the cockpit. Note fogging of perspex panels

crew told it all. They'd seen the smoke, knew the run was at nowhere near record speed. There was nothing they could do until the HPV circled the track again and came back in.

The vehicles duly returned, and the immediate problem was soon found. In retrospect at least, it was obvious what had happened. The tiny solid-tyred outrigger wheels cleared the fairings by only a millimetre or so. But the outward camber of the banked track put more pressure on the outboard, right side, wheel, forcing it into contact with the fairing. The pit crew hurriedly pulled both fairings off.

There was a consultation between pilot and designer. The official GMH photographer was nowhere in sight: that photo was staged later in the morning. I pulled out the XA and took a shot. If any of the GMH people spotted it, they made no attempt to stop me. They probably assumed, camera that small equalled garbage results.



HPV on static display at Drage Airworld, March 1997

The photo doesn't show that despite still being around 7am on a chill autumn morning, Steele Bishop was bathed in sweat after the high speed run: the HPV's ventilation was minimal, another reason why this had to be done early in the day.

Both designer and pilot were aware that the critical moment had passed: a slight, erratic, breeze was already springing up. The record attempt was de facto written off. Steele Bishop got out, and the HPV was left sitting unattended in the pit area while there was a general discussion, not only of the vehicle's problems, but also of the track.

The track, as Freewheeling correctly noted, was part of the problem. In fact, the bitumen surface was no more coarse than many roads elsewhere. But the high-pressure racing singles and even more so the solid rubber outriggers did not run well on it at all. That was that. As I did not have a day job again, statistical analyst with a local council, I left about 8am and headed to work, where no-one had the least idea what I was talking about. The helicopters, the media and the rest of it all came later. I had to wait 10 days to find out if I did in fact have the critical photo, reproduced above, after all.

I debriefed Lachlan Thompson over the phone a week or so later. Apart from the fairing trouble, the track surface itself was definitely unsuitable.

Unfortunately, closing off well polished 5 km sections of freeway for an HPV run was not on GMH's, or anyone else's, agenda. When nothing further transpired, a whole story that never got off the ground as such gradually drifted out of my purview as I moved on.

I wasn't privy to any further record attempts, but the matter came back to my attention in March 1997. I was on a trip to Wangaratta Vic and dropped into an aviation museum called Drage Airworld. I expected to see aircraft and saw a fair few, but was pulled up when in a display of vintage bicycles, there, large as life, was Lachlan Thompson's HPV.

The vehicle was mounted on a frame and still fitted with the outrigger wheels. A small information board gave a bare outline of the record attempt 13 years earlier. I asked the staff if they knew about the vehicle's history and how it had ended up in Wangaratta, but they looked blank. After all that time, I

was a little scratchy on what had happened that May morning myself.

To end the story, Drage Airworld went broke in mid-2002. The various exhibits, both static and airworthy, were sold off, as a former employee put it, 'to interested private collectors'. As the photo above shows, if you wanted your own DC-3, this was time to get one.

Lachlan Thompson's HPV, however, went briefly to a motorcycle museum in Wangaratta, then was returned to its creator, now a Professor of Aerospace Engineering at the same RMIT where he designed the vehicle as a student. Covered in dust and with the polycarbonate skin starting to peel off, it now resides forgotten in a suburban garage, a sad end, perhaps, for a very refined and elegantly designed vehicle.

The world human-powered speed record has now been pushed far beyond what it was two decades ago, with vastly more sophisticated machines, and now stands at over 130 k/mh for a single seat vehicle. Yet the Australian human-powered speed record remains at 78.9 k/mh, where it was set by Lachlan Thompson and Steele Bishop in 1984, and has never been seriously challenged in all that time.

If another attempt is ever made to break either HPV record in the southern hemisphere, it would be worthy to resurrect, if for display only, the vehicle that made the first attempt over two decades ago.

Ray Peace - ferret@alphalink.com.au

WELDALUM® Aluminium and Alloy Brazing Rods

Thought this might be worth a mention in HUFF for those who want to repair aluminium bike parts and frames. I saw this product being demonstrated at a swap meet. The guy welded two aluminium cans together - without melting them he then was able to file the new weld, which was done with a butane torch, it was much the same as brazing, it actually looked easier than braising.

<http://www.weldalum.com.au/>

Jon Finch - jonfinch@hotmail.com

Current HPV Events for Educational Institutions

On 3rd May 2005 Tasmania had its first HPV event, mostly involving schools. The north Island (Mainland Australia!!) has many events of this kind but it has been a long process to get something like this here. Tasmania has a strong culture of teaching and using cars and exciting the schools to look at alternatives is quite difficult. I'm amazed at how little any sort of cycle is used in the State and very few school students commute to school. For example, I have been at TAFE for the past 4 years and up until this year was the only cycle housed in the TAFE bike rack. As my son and I stop at his primary school of ~800 students there are no more than 8 bikes and the high school has not many more. I believe the HPV events have some chance of assisting the public's awareness of the benefits of HPV's and suggest OzHPV members contribute as they can to the existing events including:

Wonthaggi - March 18th – 20th 2005.

<http://www.wonthaggisc.vic.edu.au/hpv/index.html>

Wonthaggi Secondary College

P.O. Box 119,

WONTHAGGI. 3995.

MCBRIDE CAMPUS PHONE: (03) 5672 1344

phanley@wonthaggisc.vic.edu.au

Maryborough (Qld) Technology Challenge - Friday 2nd to Sun 4th Sept 2005

<http://www.mtcqld.com.au/>

Ross Humphries

Industrial Technology Dept.

Maryborough State High School

Kent Street Maryborough QLD 4650

Ph: 07 4120 9358 (during school hours)

Fax: 07 4120 9300

Email: rhump16@eq.edu.au

Queensland HPV Pedal Prix

<http://www.ihpva.org/people/tstrike/qldpprix/pprix.htm>

RACV Energy Breakthrough - 24th – 27th November

<http://www.racvenergybreakthrough.net/>

Martin Mark

Tel: (03) 54 610 621

Fax: (03) 54 610 665

Email: martinm@cgoldshire.vic.gov.au

Australian National Pedal Prix Adelaide - 6 hour: (14-15 May), 6 hour: (30-31 July), Round 3: Australian International Pedal Prix (16-18 September)

<http://www.pedalprix.com.au/>

Denise Clark

Telephone (08) 8377 2640

Tasmania - Salamanca 6 Hour Human Powered Vehicle Trial

Date: Sunday the 3rd of April 2005

Gary Adderton

Tel: 0400-591-217

email: gadderton@yahoo.com

HP Boat

There's been some interest in HPB's of late - check out what Peter Heal (heal@cyberone.com.au) is up to at <http://users.cyberone.com.au/heal/HPB.htm>

Also Rick Willoughby (rickwill@bigpond.net.au) tested the seventh version of his pedal boat in April. This boat uses a fibreglass outrigger canoe combined with a purpose-built recumbent pedal frame.



Version 7

Tiger Canoe, based on the Gold Coast, produced the hull with minor variations from a standard Pahoia OC1 canoe to accept the four mounting points for the frame. The frame was made in Melbourne by Greenspeed to Rick's specification but incorporates many features commonly seen

on Greenspeed recumbent trikes.



Version 4

Top speed on initial tests was 16kph and it should be possible for him to reach 18kph under ideal conditions with further tuning. An athletic pilot could be expected to attain 20kph for short bursts. Target sustained cruising speed is around 10kph.

Rick is hopeful of finding other HPB enthusiasts to form a pedal class, of 3 or more boats, to compete in the 2005 Murray Marathon on the proviso that such a class will be accepted. He has a very seaworthy catamaran (version 4) capable of a top speed of at least 15kph to loan to any prospective, but boatless, pilot to enter the event.



Human Powered Juice Making - Theo Schmidt

Abstract

A traditional hand-powered juicing method is described. An innovative human-powered preservation method is presented.

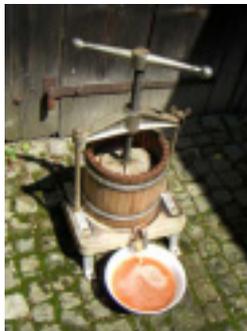
Introduction

Juice making provides an important way of preserving large quantities of fruit and vegetables for human consumption. This can be done with electrically powered machines, but many situations exist when human-powered juicing represents the most practical option. In my case this begins with an apple tree which during several weeks in August delivers 5 -10 kg of fruit per day.



[Figure 1] The apples are washed in water.

later in the harvest season, requires



[Figure 3] Press and bowl.

The apples are a curious variety, which must be processed within a day or two to avoid spoiling. This amount is ideal for traditional hand-powered equipment. A local juicing service, usually not available until

a minimum quantity about ten times larger. A hand-operated pulper and press allow me to utilize



[Figure 2] Pulper.

more of the tree's apples and saves making trips to the commercial juicer.

Much of the information here also applies to grapes and other fruit.

The juicing process

The juicing process involves gathering, sorting, washing [fig. 1], pulping [fig. 2], pressing [fig. 3], and preserving for storage unless quickly consumed. Pulping represents the key step, accomplished with a hopper-fed rotary rasp. The pulper's wooden cylinder is covered with over 50 sharp stainless steel studs (visible dimensions about 4 x 4 x 4 mm) [fig. 4]. The interior hopper dimensions are about 10 x 10 x 10 cm, perfect for small apples. The interior cylinder diameter is 21 cm, the height 24 cm. The resulting pulp is put into a fabric bag placed inside the press, where about 40% of the weight is extracted as juice [figs. 3 and 5].



[Figure 4] Detail of the pulper's cylindrical rasp.



[Figure 5] Overview of press components. Note the cloth bag.

Human powered juice preservation

Fermentation and traditional preservation

Traditionally apple juice may be consumed fresh or preserved by pasteurization in various stages of fermentation (conversion of sugars to alcohol) ranging from sweet through hard cider to apple wine and ultimately apple vinegar. The dominating yeast cultures influence the taste. Sometimes other microbial action takes over to render the juice unpalatable. Hence, modern standards of taste conformity and hygiene insist on tighter control than was the custom in the past. Today, heating to about 80° C pasteurizes fresh-pressed sweet apple juice. Afterward the juice is cooled allowing excessive solids to settle forming a sediment. For harder cider, pasteurized juice ferments under controlled conditions utilizing specific yeast cultures. Further pasteurization halts the fermentation at a chosen point. All this heating is of course energy consuming. There is another less energy intensive way.

Preservation by pressure

Fermentation slows or stops at above 5 - 9 bar, depending on storage temperature and the composition of gases present. Because a living yeast culture outgases carbon dioxide, a tightly closed container will self-pressurize. This increased pressure will temporarily slow the fermentation rate. This is not true "pressure pasteurization", which requires about 5000 bar.



[Figure 6] Quarter-liter plastic and glass bottles. Note bicycle

I simply fill the raw juice into bottles made of glass or plastic (PET). After a few days, the juice within a closed container begins to build up considerable pressure. Ordinary bottles aren't suited for this and could be dangerous. Out of a approximately one hundred, I have had one glass and one plastic bottle of the 1-liter size explode. Thankfully I wasn't around. Thus, I recommend using bottles less than 1-liter, unless the juice is to be consumed within a short while after bottling. Smaller, thus stronger, bottles have never ruptured. The greatest danger is to the eyes in the event of a glass container breaking without warning. Wearing heavy-duty safety goggles could prevent serious injury when handling or working around sealed bottles.

The pressure preserved juice tastes sweet, with a slight alcohol content and a carbonated tang. I love it! Fermentation can be

More Pics from the 05 Broadford Challenge

halted even more quickly and thus with a lower alcohol content by increasing the initial pressure from an external source and using cooler storage conditions. I do this by mounting bicycle tire valves in bottle caps and pressurizing with a tire pump [fig 6].

Opening the bottles later can be messy and exciting. A significant volume of carbon dioxide may be released causing the fluid to foam considerably. In these cases the reward of juice making is a glass of apple-champagne! Other times faulty bottle tops leak at just the right rate for the juice to preserve and then lose pressure without the formation of hard cider or vinegar. These fortunate "accidents" have not been consistently reproducible.

More efficient and far safer than bottles are special stainless steel kegs. Mine has 30 liters volume. Ideally this container would be filled completely then sealed to help reduce the amount of oxygen present, which contributes to the formation of vinegar. In order to preserve quantities of juice less than 30 liters, I pressurize the less-than-full steel container using an air pump.



[Figure 7] A 30 liter stainless steel container. Working pressure 9 bar.

However pumping in carbon dioxide rather than the ambient air may be more suitable. Future plans include injecting the juice day-by-day under pressure by using a feed pump. All of these notions include human-power of course!



[Figure 8] Approximately 9 small apples are needed to make a glass of juice.

Data

A typical run consists of processing 100 small apples (6 kg) into 2 - 2.5 liters of juice.

The pulper operates most comfortably at about 100 rpm. The corresponding force on the crank is 40 - 50 N, giving a torque of 7.6 - 9.5 Nm with the 0.19 m crank. Thus, the power delivered by the operator equals 80 -100 W.

One filling of the hopper requires about 9 turns, i.e. about 5 seconds. The force on the push lever is also 40-50 N, but nearly static. So not much power is used.

The power required to operate the press is also quite small. Most effort is spent preparing and handling the tools and materials and general cleaning.

Resources

A good site for amateur cider making is: http://ourworld.compuserve.com/homepages/andrew_lea/content2.htm



How to Look After Your HPV Engine

In the vein of previous articles which have discussed attaching an engine to your human powered vehicle, I have been considering how much we as cyclists do to maintain our "overall engine performance", or in other words our general health. If you ride a recumbent for health reasons keep reading. If you love those very technical articles in HUFF about how you can tweak your HPV for performance, then there might also be something in this article for you.

One of the aspects of riding recumbents, or any bicycle for that matter, is that the activity of pedalling is not performed over the full range of motion of the joints involved. For example, as you already know, when you ride you have a slight bend in your knee, if you locked your leg you would damage your knee – not something any of us want. So this means that your knee joint is never fully extended (a full range of motion). Various articles also support this idea, for example one web site on cycling¹ stated,

Cycling is described as a "mid-range" activity, involving a limited and repeated motion. During each revolution of the pedals, the leg is never fully straightened or bent to its fullest, so the muscles are never fully contracted or extended.

So what does this mean as far as your HPV engine goes? Well it can mean that you end up with less movement in your engine, or stiffness. For example, the same website as above describes what can happen to muscles after long term use on an HPV:

*The muscles used to pedal the bike strengthen but also become tighter and therefore shorter. This tightness can contribute to any number of overuse injuries including pain in the lower back, hamstrings and knees.*¹

However, the news is not all bad, as you know there are benefits to riding such as improved cardiovascular performance and the burning of calories⁴. Also, someone who rides an HPV may well have more flexibility than a completely sedentary person⁴. However, if you are seeking good long-term performance, maintenance is essential. For example, if you owned a car with an engine you might appreciate the benefit of personal transport, but if you never tuned the engine a reduction in performance will occur after repeated use.

How Well Does Your Engine Rate?

Try this short test.

Q: Can you sit down with your back and bottom against a wall, legs together out in front and touch your toes?

A quick survey of Victorian HPV riders revealed that over half could not reach their toes, which suggests that HPV-ers have less than ideal flexibility. Poor flexibility impacts negatively upon performance, not to mention that we all ride slower when we are stiff and sore.

So what can you do about this and why should you bother? The answer is stretching, and the reasons to bother are to reduce pain, discomfort, a decreased risk of injury and a potential increase in the power output of your engine. Stretching is helpful because it increases the range of motion across the joints involved in pedalling.

How Should You Stretch?

For a long time stretching before activity was recommended as a good way to warm up, similarly stretching as a cool down is also often recommended. However, these methods of stretching are not necessarily as good as many of us believe. Stretching before exercise is not really an effective warm up, because muscles are cold and in fact are not as flexible as when they are warm⁵. Stretching as a cool down can be effective however if the aim is to increase range of motion across joints some time needs to be dedicated to stretching, and this is often neglected in stretching.

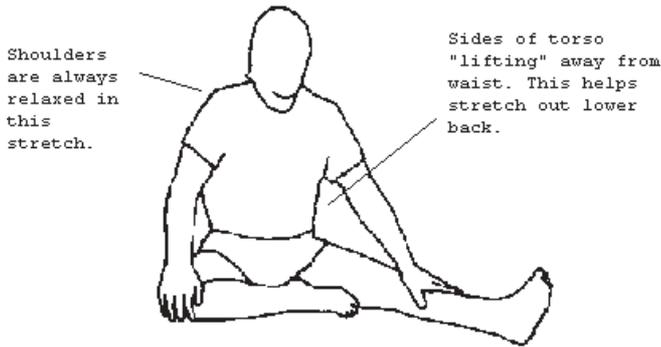
Ideally stretching should be done as an activity in itself². What does this mean? It means stretching as often as possible and for as long as possible. Holding a stretch for ten seconds, like most of us do in our cool down routine, is not really long enough. Depending on how tight a muscle is it can take 10 to 20 seconds for the fibres in a muscle begin to lengthen. As you hold a muscle in stretch, the longer it is held the further it will lengthen and this will improve long-term flexibility. So try holding a stretch for a minute or two. How often should one stretch to obtain a benefit? Ideally every day, because you are trying to reset the length of your muscles to counteract the impact of short-range of motion activities.

A recent article in the Clinical Journal of Sport Medicine, September/October 2004 and quoted by Reuters News Agency^{2,6,7} supports these ideas.

A Technical Explanation for How to Tweak Your HPV Engine - based on well-established theory³.

As a muscle contracts it has a natural tendency to slow the momentum of the joint as it moves toward the end of its range of motion, in order to protect the joint from damage. Just imagine that you have been pedalling your HPV in the same way for years and never quite extending the knee, your muscles 'learn' that the full range of motion for your joint is less than full extension. Yes, I know you are going to say, but when I stand up and walk my knees are much more extended. This is true, however there is also less force generated in standing and walking and other factors are involved. So with your leg now thinking that the range of motion for the joint is somewhere short of completely extended, as you pedal you might not be able to apply as much force through the entire range of pedalling. This is because the muscles are slowing the momentum of the joint to protect it. Thus stretching your muscles helps by teaching them that the range of motion for a joint is more than what you do pedalling – this allows for more force to be generated. Thus in theory you should be pedalling more

Hamstring stretch start position

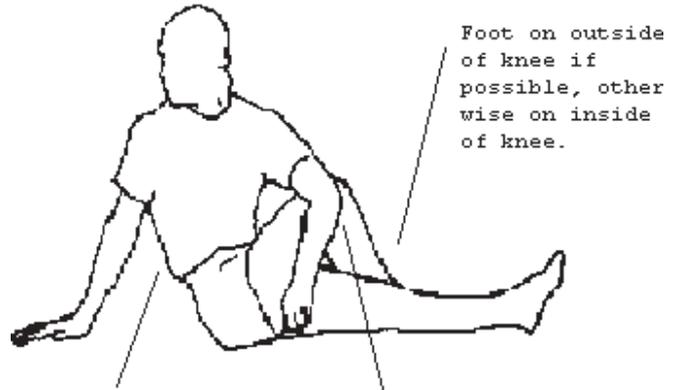


Shoulders are always relaxed in this stretch.

Sides of torso "lifting" away from waist. This helps stretch out lower back.

This stretch is often known as a hamstring stretch, which is probably a misnomer. This is because when done effectively this stretch also lengthens the lower back.

Gluteal stretch and back twist

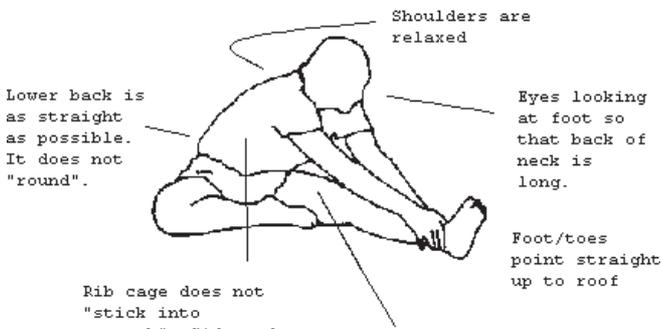


Foot on outside of knee if possible, otherwise on inside of knee.

Rib cage should be lifting away from waist. Torso should be as upright as possible.

Gentle pressure with elbow on knee. Stretch should be felt in the same buttock as bent knee and gentle twist should be felt in spine and lower back.

Hamstring Stretch



Shoulders are relaxed

Lower back is as straight as possible. It does not "round".

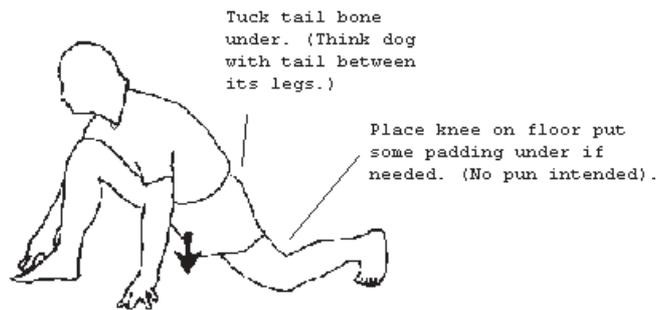
Eyes looking at foot so that back of neck is long.

Foot/toes point straight up to roof

Rib cage does not "stick into stomach". Sides of torso stretch up towards head. As if "lifting the ribcage off the waist".

Thigh muscle tightend so that back of knee "opens up".

Hip Flexor Stretch



Tuck tail bone under. (Think dog with tail between its legs.)

Place knee on floor put some padding under if needed. (No pun intended).

Gently lean weight forward into hip of extended leg and allow center of gravity in hip to travel directly down (as shown by arrow). Stretch should be felt through the front of the hip joint and slightly through the quads. If you feel it in your lower back, ease off the shift of weight and ensure your "tail bone is tucked under". In addition draw your lower stomach in. If your not sure how to do this, all you are doing is gently sucking your belly button and the portion of stomach below your belly button inwards, while still being able to breath.

Calf stretch

Press heel down to stretch one of the two muscles in the calf. (Gastrocnemius muscle)



Firm thigh muscle as well as pressing heel down. This will give you maximum stretch.



Press heel down while having a slightly bent knee to stretch the other muscle in the calf. (Soleus muscle)

efficiently and faster! This should also reduce your experience of stiffness and soreness once you dismount.

The how to bit...and the disclaimer bit...you do these at your own risk OzHPV and I take no responsibility...

These can easily be done in front of the TV...Grab yourself a timer and try holding them for two minutes each...Pay plenty of attention to technique, poor technique is as good as not doing a stretch. If you are not sure ask a physiotherapist, massage therapist, good personal trainer, or good yoga teacher. These are just a few stretches for the major muscle groups used when riding; there are a lot more stretches that would also benefit HPV riders.

