Converting our gas loco to hydraulic power
Plan and Report
Paradise Valley Railroad, Powell River BC

As of Jan 14, 2025

Requirement
Our gas loco's cone-to-flywheel drive system is causing us significant resources to maintain because no suitable cone material can be found, and the linkage rods and drive shaft system are worn out. Also, all other systems and the wheel sets need an overhaul.

Solution
We have begun a project led by Russ Evans to convert the power system to hydraulic and do the general overhaul. The loco's 7 hp gas engine will remain as the primary power, but the flywheel, cone drive and linkages will be removed and replaced with a hydraulic pump, a hydraulic motor, and associated tank, filter, valves, tubing etc to provide our gas engine loco with an extended life. Other systems (Wheel sets, Engine, Braking, Electrical, Air systems, Alternator) will require a re-furbishment and re-installation.

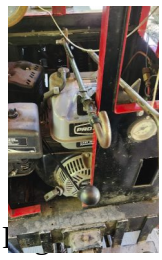
Cost
Current estimate: $4100. A preliminary budget of $2000 was approved by Directors, but it did not include all the required items, and supplier's costs have risen since the first estimate. Initial estimates came from Princess Auto and an Edmonton firm, but they did not provide any design assistance. After further research, Russ has sourced the parts locally with Aero. Taran @ Aero has provided some valuable volunteer expertise which has raised our confidence in the design and it's cost estimate. Details are in a spreadsheet below.

Schedule: Subject to revision as resources and issues arise; In 2025, by

Jan 12	Move the loco and tender to Rick's shop, strip to the frame **Done**
Feb 1	Remove the old power transfer system (Cone and drum)
Feb 15	"Dry Fit" and fabricate the support structure for new parts
Mar 1	Install primary power transfer systems (Hydraulic drive)
Mar 15	Install secondary systems (Braking, Electrical, Air systems)
April 1	Return the loco/tender to the tracks for testing (also April Fool's Day !!!)

Implementation Team
Russ Evans is authorized as designer and implementer, responsible to our chief engineer Dan Parsons for technical matters and Dave Florence for administrative/financial management. Karl Schoen and Rick Lundgren have volunteered their shops and assistance. Russ will call for additional assistance as needed and provide periodic reports and photos for the PVRail work party group and PRFHS board.

Page 2: the latest budget spreadsheet; Page 3: Progress notes; Page 4 backgound material


Update on the Hydraulic upgrade

I have ordered the initial hydraulic components from AERO ($1683.56).

This is slightly more expensive than Princess Auto but the parts are higher quality and being local we will have support for any adjustments we need to make.

Taran at AREO has been a fantastic resource and has already given us a significant discount of $643.77

"Best Guess" parts and cost

Quan	Ordered	Part # SKU	Item	Description	Cost Estimate		Actual to date
1		8317216	Reservoir	5 gallon w' sight (18.5 x 10.5 x 12 in)	$336.00	$336.00	$0.00
1	1	8669673	Valve	3 position / directional	$465.50	$465.50	$325.00
1	1	1259019	Spool	BM20 Bypass / motor spool	$36.00	$36.00	$0.00
1	1	8375354	Pump	Pump 3.2 gpm (motor w' new seal)	$807.44	$807.44	$585.00
1	1	8375388	Motor	1/5 rpm of pump	$463.26	$463.26	$341.35
1		8076069	Filter head	1/2 inch w' 5 GPM	$30.00	$30.00	$0.00
1		8038651	Filter		$24.00	$24.00	$0.00
1	1	8252751	Pressure relief	10 gpm adjustable relief valve	$341.77	$341.77	$251.83
1		Areo custom	line	suction - line to pump	$100.00	$100.00	$0.00
1		Areo custom	line	pressure - pump to valve	$100.00	$100.00	$0.00
2		Areo custom	line	pressure - valve to motor	$100.00	$200.00	$0.00
1		Areo custom	line	pressure - valve to filter	$100.00	$100.00	$0.00
1		Areo custom	line	pressure - filter to reservoir	$100.00	$100.00	$0.00
1		8652307	Gauge	pressure	$36.00	$36.00	$0.00
1		9188491	Oil	CASTROL Hyspin AW 32 Hydraulic Oil	$120.00	$120.00	$0.00
1				Emergency Brake	$200.00	$200.00	$0.00
1				Metal and consumables	$200.00	$200.00	$0.00
					Sub-Total	$3,659.97	$1,503.18
					Tax	$439.20	$180.38
					Total	$4,099.17	$1,683.56

The sponsors page has been updated to reflect the discount provided by Aero.

Motor/Pump fluid ratio: “We “guesstimated” the current engine to run at about 1200 - 2000 rpm. The current gear ratio is roughly 8:1. 1200/8 =150 2000/8=250”
.... “Some railroaders on 7.5 gauge railroads choose a max speed of 6 mph, which would take about 3 mins 30 seconds on our 1/3 of a mile track. We typically go about half that speed, ie a 7-minute ride. So say we designed the hydraulic loco to go a max of 6 mph, = 105 inches per second.
If the loco wheels are 7.5 inches at the tread (needs an accurate measure), that's about 23.5" circumference, so the wheel axel would rotate at 105/23.5 = 4.5 rotations per second, = 270 rpm to go 6 mph. *(Note: the wheels will be reduced on the lathe, then a tread applied, so the wheel diameter could change)*
The hydraulic motor is on a different axle so the chain gear ratio could be other than 1, i.e., its rpm would be corrected by the sprocket ratio of the drive chain. At 1:1 gearing, 8:1 fluid ratio means the engine would go at 8 x 270= 2160 rpm to travel at 6 mph.”

Rough Notes on progress from Russ

Jan 14:
Strip down to Frame ✅
New plug purchased ✅
Fresh 10-30 oil on hand ✅
Carb rebuilt and ready for install ✅
Love-Joy here Friday ✅
Brake disc and callipers sourced - here Friday ✅
Hydraulics on hand ✅
Extend oil dipstick and add drain system - in progress
Clean up frame - in progress
Reservoir - on hold till inside dimensions available
Alternator - still working on it
**** Wheels and axles - need full rebuild (in Dan's shop) ****
Fabricate coupler between motor and pump - in progress
Add v-belt pulley to assy. For alt. - in progress
Run up motor with new bits - in progress

Approval email:
---- email to directors Oct 28 ... Resolution was approved unanimously:
Hi Directors, Russ and Karl Dan and Russ reviewed the project together on Oct 27 and agreed on the way forward, essentially as proposed in the Oct 22 email, copied below.
Please note that:
- The project carries some risk, in that the technology is new to us and we are not finding experts providing detailed responses to our requests for advice.
- Russ will keep Dan, our chief engineer, and the board members informed of any design changes, any forecast budget overruns, any significant schedule changes, and installation progress.
- Karl is included in this correspondence because he has kindly offered to be Russ' main assistant.
- Russ knows that the board members are available to assist when requested.
The Resolution:
Resolved that the PRFHS:
1 commits to modifying our gas loco #1 to hydraulic propulsion before our next season (May 1, 2025), with a budget of $2,000. *(If hydraulics becomes un-doable, we will consider an electrical conversion.)*
2 accepts Russ Evans' kind offer to be the lead designer, procurer and implementer within the guidelines provided by our Chief Engineer Dan Parsons.
Please reply with a yes or no on this resolution:
cheers, Dave Florence