





# Compatibility of Hydrogen Blends with Type B Appliances

A HyP MV Case Study

Consult Engineer Deliver Ideas Realised



## GPA

## Acknowledgement of Country

We acknowledge the Kaurna people as the Traditional Owners of the lands on which we meet today and pay our respects to their Elders past and present.

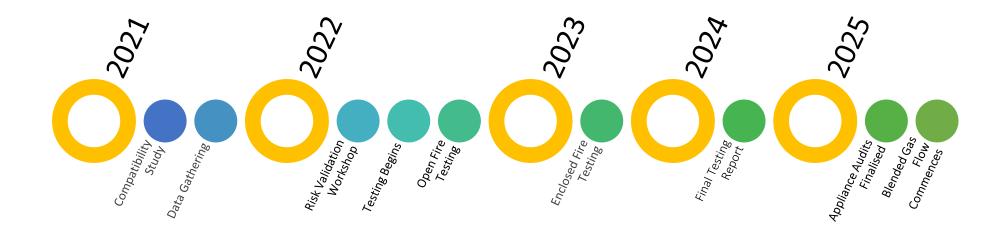
We also recognise the Wiradjuri people as the custodians of the Murray River area, where the HyP MV project is located, and their continuing connection to the land, water, and community of the Murray River.

Silk painting artwork created by GPA Engineering staff with Tjimari Sanderson-Milera from Kumarninthi Cultural Education





### "It's not the destination, It's the journey"







### **Achievements**



A complete register of Commercial and Industrial Appliances in the Albury Wodonga Region



Cross industry collaboration – all of the experts in the room!



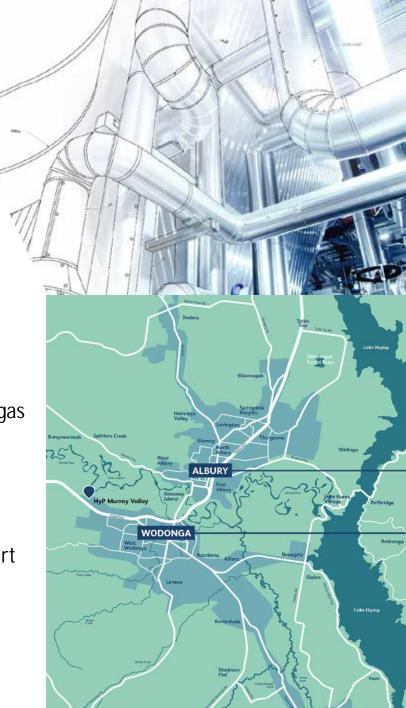
Looking beyond the residents, engaged with over 300 business who use gas commercially and industrially



Planned and provided advice for the test programs through the FFCRC



Confidence to safely and reliably deliver renewable hydrogen to start decarbonising the Albury-Wodonga gas network







## What do we know? Type B Appliances

Anything with a gas consumption rate that exceeds 10NJ/h

- > Appliance populations are diverse.
- Must be signed off by a Type B certifier.
- Resilient and long-lasting investments.
- > Burners are central to how they operate.
- > The appliances are usually central to the owner's business function.











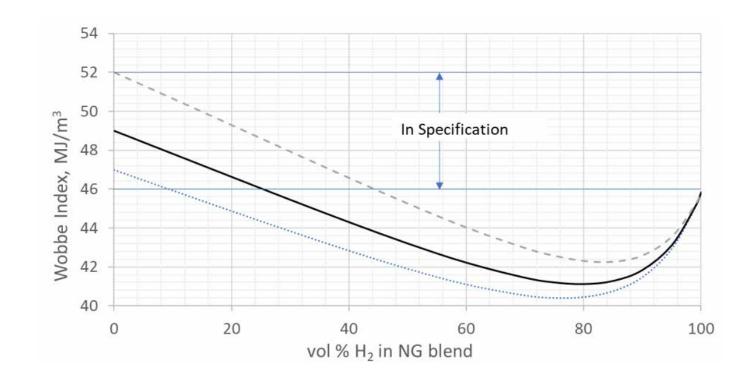




## What do we know? The Combustion Properties

#### Is 10% H2 different? (from literature)

- > ~ a 2% reduction in Wobbe Index
- > ~ 6-8% reduction in HHV
- ~3% increase in moisture content of exhaust gases
- > ~1% increase in flame temperature
- > ~50% increase in flame speed
- > Requires less air for combustion







## What did we need to find? Impact to customers

#### Over 300 commercial and industrial customers

No existing data!

What types of appliances are in use?

What condition are they in?

What concerns do customers have?

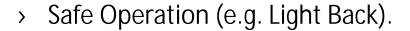








### In 2021 (Pre-FID), What were we worried about?



- Materials Related (e.g. Embrittlement).
- Appliance Efficiency & Operation at Maximum Capacity Heating (e.g, Flame temperature)
- > Emissions Increases (e.g. NOx, CO, Combustion Performance & Air Fuel ratio adjustments)
- > User Interface (e.g. Odorant)
- > Final Product Quality (e.g, Brick making kilns).







## So, what did we do? Risk Validation Workshop

### All the right people in the room

- > Burner experts
- Gas Fitter/ Certifier(s) with Albury Wodonga Network experience
- > Researcher(s) from FFCRC
- > Project Representative(s)
- Appliance Owners (for selected appliances only)

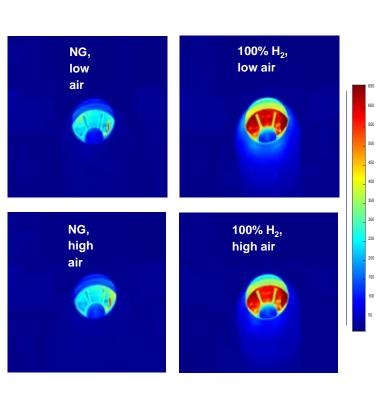
			limitar references, contained therein.																		
	PROBLEM DESCRIPTION					Initial Plak Rating						Roaldwal Risk Rating									
TEM No.				EXISTING CONTROLS OR MITIGATION								ADDITIONAL CONTROLS OR MEASURES PROPOSED								ACTION REQUIRED	
		APPLIANCE DESCRIPTION / CAUSE	CONSEQUENCE																		
21.9	Pool Mater Heater Pool Heaters	These are basically 2 topos of butter systems deplead in this class.	Changes in NV or HMV caused by inheduction of hydrogen business introduces a potential	The change in this parameter is only of the order of 2% on is not expected to be a major lesse.								Refer generic burner RRI forms 1.8 and 1.2 for fairly defects.								Flafor Action List Burn 17 applicable to this close of applicable to this close.	AS
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	(73 Identified in the Albury/Wedonge Anno	ayalom.	The pilot systems generally have a fixed jet	The flammability range and flamo temperature increase of HC may actually components for the								options to modify or use explanement, pilot styles- that may have loss starting lesues. Discussions									
	Promis Barner Types	Viery of these types fall under the Type A. Appliance close except for the larger capacity lunits remainsed here.	energement so as the energy of the fuel decreases these could be issues with reliable	ding in snorps and may assist eners lighting. For oversit human trees with based draft	Trial	Torse	Mose	Trial	War	Streetman	14	with major worders such as Rayper who are Australian based on implications of H2 injection	Test	No.	New	Total	Mose	Millely	***		
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			are a known less,o.	porty to make adjust times to the acrossic.																	
			As such any neturities of energy in the plint. Name may amplify this entiting base.																		
1.2	Hot Water Heaton Pool Heatons	These are benically 2 types of butter systems depleased in this class.	The impact of a higher flame speed in in effectively serve the flame closes to the burses	Relat NS 1.5.								Given the large installed base of Flagues'  Framer, applicances in the naturals and given								Rafor Action Libr Roses 6.7.8 and 17 applicable to this class of appliance is political.	AG
	Flamo Speed	The Magnes and Rendemen state that makes up	and increase the potential for a "light back" occurrence.									Raypar is Australian based the menalectarer should be approached to antiotake specific									
	(73 Iduatified in the Alburyllifeticege Ares)	the majority of bealers in the reinsort are of a jons-role state with a satural deal's expirated air leaders.	Light Back places the flome in treations for which a turner made may not be designed.									landing and provide advice with respect to property for blow back.									
	Promis Gamer Types Opported 40 off)	Name of these ignes tell order the Type A. Appliance close enough for the largest expectly large considered hore.	The impact on an applicance cusped to a high fluence growth is highly deposition in the burner dentire.																		
		in instantaned up to 10% NZ at literature instant	Parker Germatio S.H. Bern S.A.																		
		of introding famo spood as ribrarised andle possels RR Bers I.A.	Gen he on house for any vigite of gree-min is amor for which like appearant this loved home will apply.		lever	Total	term	No.	hore	Street	164		Berary	New	lever	teres	feen	Samola			
			Nis princi that for premis sigle formers the																		
			valually of the preprint had in the layray manus- must be maintained above the form upont to avoid blowfund. This may make this periodally																		
			are becaused born firm. Mindows properly business your																		
			respired to have sjapen to blow both premisions. In the premis lines but this stees met apply to all lowers on this release.																		
			This salespay of appliance is identified as one																		
513	Hol Water Haster	These are basically 2 types of burner systems	ntere colo of light hand, is significant.  Petential as lad buttomes leaves for combustion.	for manneral width and ratios in provinciant in Pressur																	
	Proof Finations Stroightsmotes Ain/Final	doplesed in this sizes.	efficiency is decrease.  Loaner faci eff dêne insure's amoste air so ret o	burnors due to the mean rate of fuel.																	
	Ratio	In the reagant and nerosenat state that makes to make by of houses in the actions are of a pre- mic state with a natural chaff system. Many of	selets consum at 175 HZ.	greatly by charge.																	
	(73 Identified in the Albumillindorpe Area)	Proce toll series the Type A class until they accessed a series vido.		Marker Goranto RM 1.2 for Faither discussion.	244	Torse		Treat	Tree	totale											
	Promis Garner Types	Gunanily in this lype of humar system the air		Any combustion efficiency leaves are not as- critical for the water fraction services consistents																	
	George 40 off)	U.ol solies is determined by the mass flow of feel into the premis chamber. As such as classify or		No.																	
		volumetric role champes the air nill herk accombingly.																			
11.4	Hot Maker Heater Pool Heaters	A 10% Hydrogen bland will insecse the water products discharged with the conduction gas	Refer gement discussion under generic risks Reciptor RR 1 Name 1.7 and 1.8	For the general class of Hat Water harbor condustroe green are all ducted to demosphere.																	
	German, Heature	streen. As much as a Mi. increase in eater product		The products of contountion are refoly verted																	
	MON otc.	emissiens is produted for a 10% hydropea natural gas bland.		and do not interset with any process.																	
	(79 identified in the Albury/Weddings Area)	For a #2 sich fedinals 00 amissions atouid sol be advesselv impedied.		Ofen excess cliuter at is street into the extract fee such that the impact on changing fuel composition about not impact emissions.	190	1908	100	1760	1100	BURNEY.	101										
		Other services and studies have indicated		tue carqueror arous no ripad e resers.																	
		measurable increases in NDK emissions are not expected at 19% or believ HB consentrations																			
		and only becomes a concern as concentrations this wall above 30%.																			
1.1.5	Package Gurner Style Hot Mater Heater	For the hot water fleaters that have package able burners; there are two types of (gritton	This type of package burner that does not have a separate pilot may be subject to the fosses.	Refer RR1.2 which is particularly applicable to the expending flame ignited style package								In the testing of pockage formers it is essential that see cathed out or the two sub-								Perfor Author (Nem 4.	AG
	Impact of 10% 40	systems	under Seneric risks register RR rase 1.2.	Duries.								types of burners that are fined air psokaged and modulating sindswood style. The modulating									
	compared to other burners.	Ploted tyriter - These are preset and should not be imposted.	Allak assessed is based on the start gos issue and potential report on consumers with									type offers the athlifty to fame start gas oil ratius and parameters whereas with the fixed oil units									
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	rates.	starting gas rate flowe through the resinitaaner where the start gas rate is limited to AG 361 4 limits, is these there is no specific pilet but have			Base"	Torus	Steers	100	Mee	Date of the last o	14	systems such as exposeding flams ignition versus interspiral and continuous pilot systems should also be considered.	Minor	Terror.	Sware	Test	Mine	Ramon			
		expert ignitor at the main burner.										OF OF BURNES.									
		As the gas rate will be energinally lower and energy-content lower there may be issued with																			
		reliable starting.																			
		tasues with blow back citc. shows one not an assure with those boses of burner.	1					1													

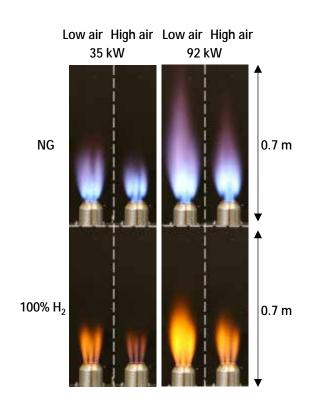


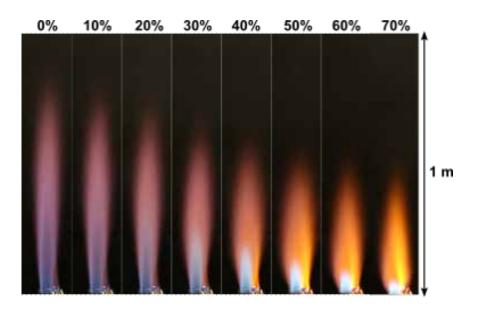




## 2022 – 2024 – Testing!













### What are we comfortable with?

- > We can do 10% safely, and potentially up to 20%.
- > Customers are comfortable because of high quality engagement.
- > Data from HyP SA is confirming safe operation of appliances.
- > Process has been applied across other Australian jurisdictions.



Consult Engineer Deliver

Ideas Realised

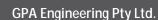












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