



WE CONNECT, GROW AND POWER THE WORLD

OVERVIEW

WESTERN AUSTRALIAN SPECIALTY ALLOYS



Western Australian Speciality Alloys

are a manufacturer and global supplier of Ni Superalloy and select Fe based alloys comprised of two facilities - WASA Perth, a specialist melting facility with expertise in VIM / VAR / ESR melting practices, and WASA Albury, a specialist forging facility with expertise in round billet / bar, block products and shaped bespoke forgings. Both facilities are based in Australia and are part of Precision Castparts Corp.

WASA - Perth

- Located in Perth, Western Australia
- Commissioned in 1993
- 6800 m² of manufacturing areas
- Exclusively for melting of high temperature Superalloys

WASA - Albury

- Located in Albury, New South Wales
- Acquired by WASA in 2013
- 12000 m² of manufacturing areas
- Forging operation for nickel and steel alloys

PERTH CAPABILITIES

VIM / VAR / ESR CAPABILITIES



WASA's vacuum induction furnace has a melting capacity of 5 tonnes (11,000 lbs) or 15 tonnes (33,000 lbs) and can produce input stock for master melts or secondary and tertiary melting.



WASA's VAR furnaces have upgraded control systems for precision melting control. Ingots can be supplied via the double melt VIM + VAR process or the triple melt VIM + ESR + VAR process for premium quality rotating grade applications.



WASA operates modern Consarc and ALD manufactured ESR furnaces for the supply of round double melted VIM + ESR ingots or as feedstock for the VAR in the triple melt VIM + ESR + VAR process.

ALBURY

CAPABILITIES

FORGING / HEAT TREATMENT / MACHINING / TESTING / CERTIFICATION



Forging and Auxiliary Equipment

Davey 2300 Tons Open Die Hydraulic Press:

- Fully re-built and upgraded in 2012
- Double rail bound manipulators
- Fully integrated control system
- Six forge furnaces certified to AMS 2750
- Medart bar peeler and full machine shop with CNC capabilities
- Matec immersion ultrasonic tank - Fully NADCAP certified
- Heat treatment furnaces surveyed to AMS 2750



Forged Products

- Inconel - 625, 718, 725, 825, 925, 945X
- Bars
- Slabs
- Discs
- Stepped Forgings / Bespoke Forgings



Fully integrated lab and test facilities, which include the ability to perform destructive inspection including:

- Tensile
- Impact
- Hardness
- Micro & Macro
- Cleanliness
- Grain Size
- Non-Destructive Ultrasonic
- Mag Particle
- Dye Pen & Dimensional Inspection

W R O U G H T P R O D U C T

SUPERALLOY INGOT / BILLET / BAR



Producers of VIM / VAR or VIM / ESR Superalloy ingot, billet, bar, and block for forging, ring rolling, and machining applications for space exploration, commercial and military aerospace, power generation, and oil & gas markets.



Profile consists of over 40 wrought alloy grades including IN718, Waspaloy, IN625, X750, 13/8, IN725, IN925, R41, IN945, IN945X, S188, C263, IN907, IN909.

WASA Wrought Advantage

- Flexible MOQ's
- Competitive lead times
- Competitive pricing
- Local stocking where applicable to facilitate expedited / on-time delivery



Wrought Product Condition of Supply

- Turned or peeled
- Ingot sizes:
 - Nominal 16" (405mm) diameter
7275lbs (3300Kg) finished ingot weight
Double melt process
 - Nominal 20" (508mm) diameter
9480lbs (4300Kg) finished ingot weight
Double or triple melt process
 - Nominal 24" (610mm) diameter
14550lbs (6600Kg) finished ingot weight
Double melt process
- 18" VIM / ESR ingot
 - Nominal 18" (457mm) diameter
9260lbs (4200Kg) finished ingot weight
- 6" - 14" round billet, other sizes or stepped forgings available on request
- 4" thick - 23" wide block, rough-machined to size
- Random lengths or cut weight



CAST PRODUCT

VIM SUPERALLOY MASTER BAR STOCK



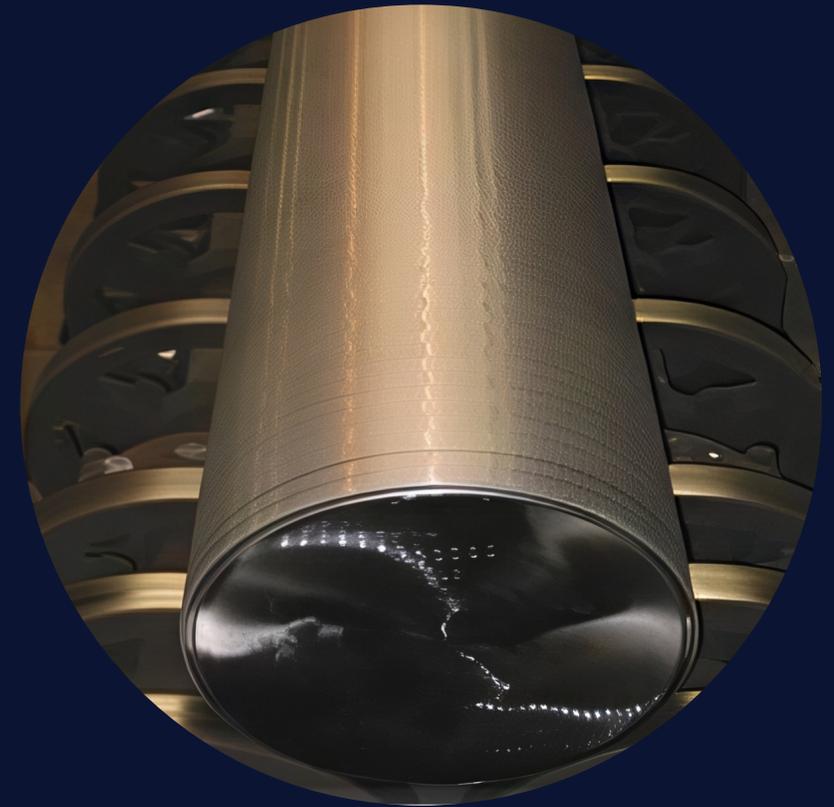
Producers of VIM Superalloy ingots either for use in casting applications or input stock for powder material for space exploration, commercial and military aerospace, and power generation applications.



Master bar-stock used in equiaxed, columnar grain, single crystal and powder atomization applications. With a total portfolio of over 60 separate grades. Examples of the major alloys produced are 13-8, IN738, GTD111, R108, MM247, IN792, MM002, C1023, IN713, IN718, R77, PWA1455LS, PWA1475LS, IN100, R88, RR1000, ME16, SRR99, IN939.

WASA Cast Advantage

- Brick Lining for crucible - this leads to reduced abrasion and hence reduced ceramic inclusions in melt
- Direct pour launder system, direct fill of stick moulds, reduced inclusions
- Double filtered as standard, triple filter available
- Local stocking where applicable to facilitate expedited / on-time delivery
- Competitive lead times
- Competitive pricing



Cast Product Condition of Supply

- Ground
- Shot blast
- Laser cleaned
- 3" up to 7" diameter
- Notched to weight
- Cut to weight
- 5t MOQ / order increments

Melting Capabilities

- Vacuum Induction Furnace
- WASA's vacuum induction furnace has a melting capacity of 5 tonnes (11,000 lbs) or 15 tonnes (33,000 lbs) and can produce input stock for master melts or secondary and tertiary melting.



CAST PRODUCT

TECHNICAL STRENGTHS



Along with standard grades of Superalloy, we offer collaborative, tailored, chemistries for long life, extreme temperature, resistant applications – beyond the scope of industry practices. Our technical expertise includes:

- Iron based vacuum alloys, derivatives of air cast grades.
- Unusual or one-off chemistries such as Boron dominant bearing Superalloys, rare-earth additions.



We are able to achieve, consistently, ultra low residual levels of targeted trace elements - S, O and other trace elements.



We are able to formulate charges of virgin and/or processed revert to specifications for the most stringent requirements.

1 I A																	18 VIII A				
H Hydrogen 1.00794																	He Helium 4.002602				
3 Li Lithium 6.941	4 Be Beryllium 9.012182															5 B Boron 10.811	6 C Carbon 12.0107	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984032	10 Ne Neon 20.1797
11 Na Sodium 22.98976928	12 Mg Magnesium 24.305	13 Al Aluminum 26.9815386	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.065	17 Cl Chlorine 35.453	18 Ar Argon 39.948											36 Kr Krypton 83.798			
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.9559	22 Ti Titanium 47.887	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938045	26 Fe Iron 55.845	27 Co Cobalt 58.933195	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798				
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.9063	42 Mo Molybdenum 95.96	43 Tc Technetium [98]	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.76	52 Te Tellurium 127.6	53 I Iodine 126.90447	54 Xe Xenon 131.293				
55 Cs Caesium 132.9054519	56 Ba Barium 137.327	Lanthanoids		72 Hf Hafnium 178.49	73 Ta Tantalum 180.94788	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.222	78 Pt Platinum 195.084	79 Au Gold 196.966569	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.9804	84 Po Polonium [209]	85 At Astatine [210]	86 Rn Radon [222]			
87 Fr Francium [223]	88 Ra Radium [226]	Actinoids		104 Rf Rutherfordium [261]	105 Db Dubnium [268]	106 Sg Seaborgium [271]	107 Bh Bohrium [272]	108 Hs Hassium [277]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [288]	112 Cn Copernicium [289]	113 Nh Nihonium [290]	114 Fl Flerovium [298]	115 Mc Moscovium [298]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]			
57 La Lanthanum 138.90547	58 Ce Cerium 140.116	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.242	61 Pm Promethium [145]	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.9253	66 Dy Dysprosium 162.50032	67 Ho Holmium 164.93032	68 Er Erbium 167.259	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.054	71 Lu Lutetium 174.967							
89 Ac Actinium [227]	90 Th Thorium 232.0377	91 Pa Protactinium 231.03688	92 U Uranium 238.02891	93 Np Neptunium [237]	94 Pu Plutonium [244]	95 Am Americium [243]	96 Cm Curium [247]	97 Bk Berkelium [247]	98 Cf Californium [251]	99 Es Einsteinium [252]	100 Fm Fermium [257]	101 Md Mendelevium [258]	102 No Nobelium [259]	103 Lr Lawrencium [260]							

QUALITY

APPROVALS & AWARDS



We apply the highest standard of process controls using the very latest in analytical equipment and ensure the most exacting requirements are achieved.

✓ S1000 (GEAE)

✓ S400 (GEAE)

✓ SABRe 9000 (RR)

✓ ISO 17025

✓ ISO9001

✓ AC7000, AC7006, AC7101/1,
AC7101/2, AC7101/14 (Nadcap)

✓ AS9000

✓ AS9100

✓ PWA LCS

✓ NATA 17025

HISTORY OF SUPPLY

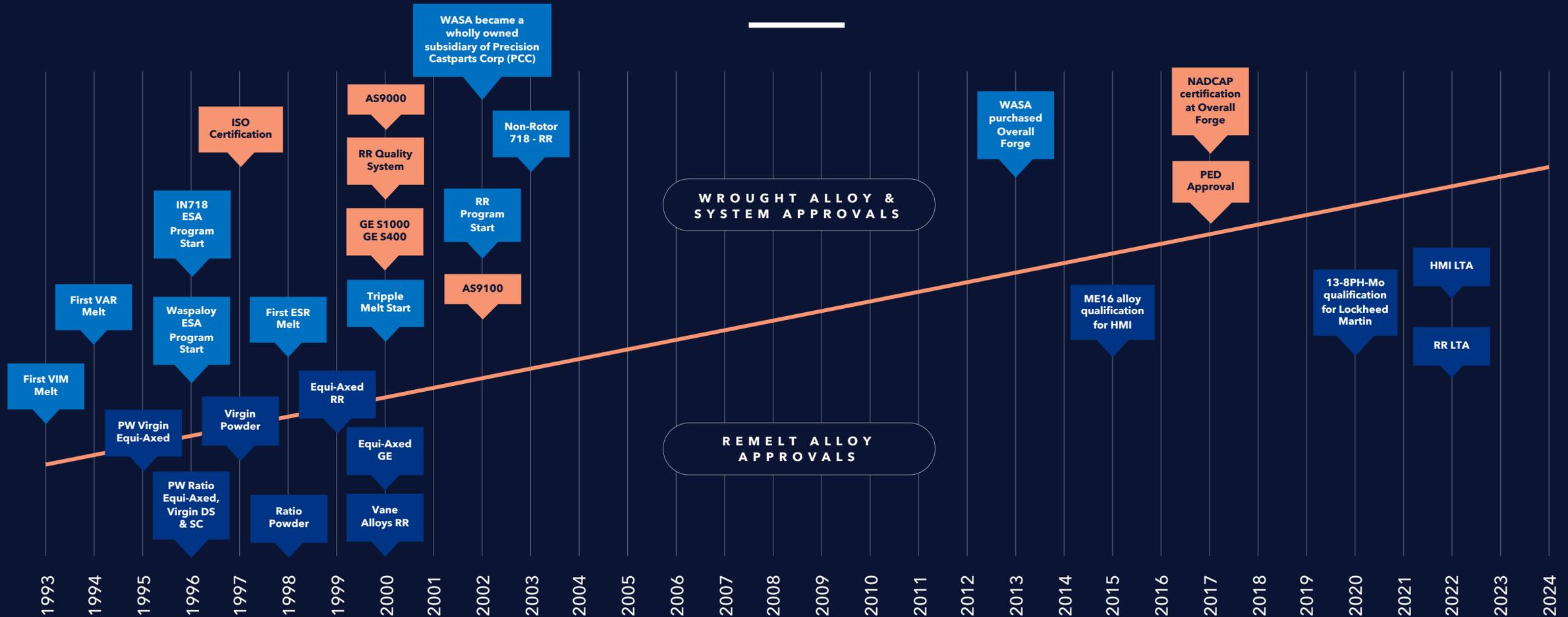
- Approved supplier to **Pratt and Whitney** since 1995.
- Approved supplier to **Rolls Royce** since 1999.
- Approved supplier to **GE** since 2000.
- Approved supplier to **Turbomeca** since 2005.
- Approved supplier to **Boeing** for 13/8 since 2012.

Approval from aircraft engine manufactures **GE, Rolls Royce** and **Pratt and Whitney**, for ingot melting procedures used for forging and casting alloys.

WASA also supplies to IGT customers including **Siemens, Alstom, Mitsubishi** and **GE**. Oil & Gas customers include **Exxon Mobil, Chevron** and **BP**.

TIMELINE

EVENTS SINCE COMMISSIONING IN 1993



C O N T A C T

PERTH

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