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Rapid Solidification

Aluminium as strong as titanium

RSP Technology BV is an innovative firm, specialised in the development, production and marketing of Rapidly Solidified Aluminium (RSA) and its (semi-finished) products.

RSP Technology uses a rapid solidification process called '*meltspinning*', which generates aluminium with properties superior to conventional aluminium alloys.

RSP Alloy applications

Thanks to RSP Technology's unique meltspinning technique, RSP alloys exhibit properties and features far beyond the limits of conventional alloys. This is due to:

- a much finer microstructure;
- far more flexibility in alloying than conventional alloying techniques.

RSP Technology focuses on several different types of applications:

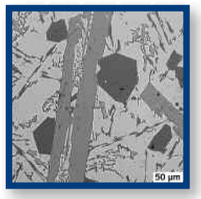
- high strength and low thermal expansion at temperatures up to 400˚C (RSA-42X, AlSi).
- high strength: up to 900 MPa Ultimate Tensile Strength (RSA-70X, AlZn), comparable to the strength of titanium.
- high stiffness (high Young's modulus) medium strength (RSA-40X, AlSi7).

Special alloys on demand

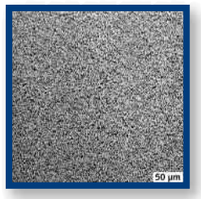
In close cooperation with our clients, alloys can be optimised by focussing on user-specified functionalities such as wear resistance, strength, expansion, ductility, conductivity.

RSP microstructure

Thanks to the rapid quenching of the meltspinning process grain sizes are very small (± 2 micron). Intermetallic phases and non-soluble constituents are refined and homogeneously distributed into the matrix and are characterised by a more favourable morphology. To a large extent, these factors contribute to an improved ductility of RSP. The pictures on the right show the difference in microstructure between RSP and a conventional cast aluminium alloy with an identical chemical composition.



Conventional microstructure

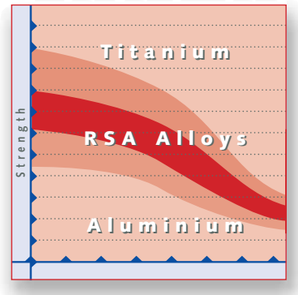


RSP microstructure

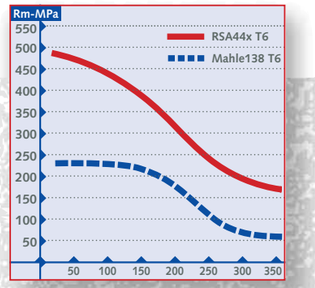
Alloy flexibility

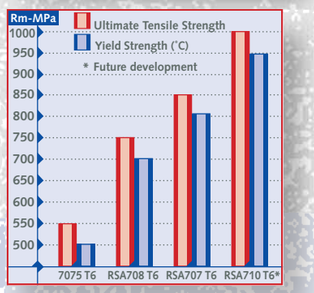
The natural maximum solvability imposes major limits to the content of alloying elements in conventional DC casting. The meltspinning process, however, generates ultra fast cooling rates. This creates great flexibility, thereby allowing the production of new and exotic alloy compositions such as AlSi40%X or AlFe15%X. Thus meltspinning is capable of providing custom-made solutions for applications that demand special requirements.

Graph: RSP fills in the gap between aluminium and titanium



Graph below: RSP - Piston Alloys



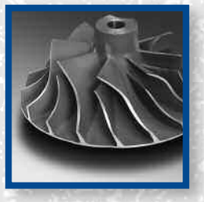


Graph above: RSP - High Stength Alloys

Markets

automotive industry
pistons, cylinders, exhaust-valves, connecting rods, space frame parts

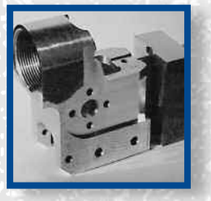
aerospace industry
construction parts, heat resistant parts, fasteners



sports industry
bicycles, skates, golf clubs, mountaineering and archery equipment

electronics
thin walled & high precision components (micro-profiles), signal processing, wire

machine building
high stiffness - low weight parts, heat resistant parts, hydraulic parts, dies



Advantages

• Higher strength
The strength of RSP can compete with the strength of steel or titanium. In addition, RSP Technology offers special alloys that display high strength at elevated temperatures.

• Higher ductility
Due to its fine microstructure RSP has a high ductility which allows relatively easy mechanical forming (e.g. higher extrusion speeds, lower extrusion loads or ultra thin wall extrusion down to 0.2 mm).

• Lower thermal expansion
The thermal expansion coefficient varies with alloy composition. Depending on the compromise of properties it is possible to optimize just the thermal behavior. All alloys with thermal expansion of steel are in our program.

• Superior surface finish
Fine machining of RSP-alloys results in very low surface roughness: down to 5 nm. This makes RSP applicable in fine mechanical parts, mirrors and tools for high precision injection moulding, especially optics such as contact lenses and spectacles.

• Good machining properties
Despite its much higher hardness, tests prove that the wear on tools after machining RSA-AlSiX alloys is identical to (or lower than) that of tools that are used for machining conventional alloys.

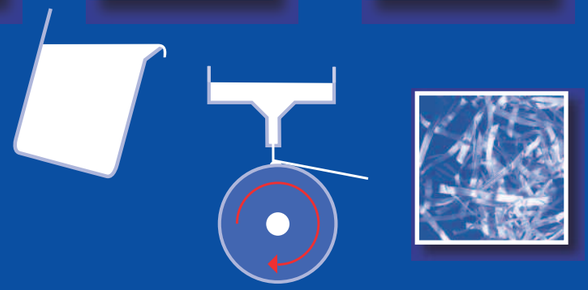
• Better wear resistance
Due to the high wear resistance of RSA-AlSiX alloys, surface treatments such as hard anodising can be omitted under certain conditions.

RSP product forms

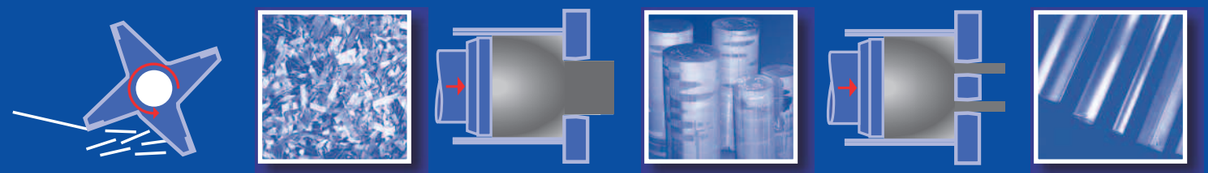
RSP alloys are available in flakes, billets, bars, extrusion profiles and wire.
Further processing may include forging, machining, bending and anodising.

Meltspinning process

During the meltspinning process, molten aluminium hits a fast rotating wheel and almost instantaneously releases a continuous metal ribbon at room temperature. This ribbon is converted into flakes and finally into an extrusion product, after which a special heat treatment may be applied. The name Rapid Solidification Process stems from the sudden temperature drop that takes place at a rate of more than 1,000,000˚C per second as the aluminium comes in contact with the wheel.



Melting and alloying ▸ Meltspinning ▸ output: RSP ribbon



▸ Chopping ▸ output: RSP 'flakes' ▸ Compaction ▸ output: RSP billet ▸ Extrusion ▸ output: profile/bar