Light Weight Structures and Light Metals for New Electric Vehicles

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Outline

- General Information about LKR
- Main activities regarding Light Weight Structures and Light Metals for New Electric Vehicles
- Outlook
- Conclusion

General Information about LKR

Development, integration in AIT organisation, LKR organisation chart
General Company Information

- Austrian Institute of Technology (AIT)
  - Number of employees: 977
  - Location: Seibersdorf, Austria
  - Largest non-university research establishment in Austria
- LKR
  - Number of employees: 37
  - Location: Ranshofen, Austria
  - Turnover: about 5 million euros
  - 100% subsidiary of the AIT
  - Non-university research establishment
- Certificates
  - ISO 9001
  - ISO 17025
LKR's main focuses

AIT is one of Europe’s leading mobility research centres.

LKR a business unit of AIT’s mobility department and focuses on:

- Material development
- Process development
- Material based design

Light Weight Structures and Light Metals for New Electric Vehicles
Main targets and research topics

- Optimal utilisation of the properties of light alloys in single parts, components and assemblies, especially as a combination of low weight and high safety characteristics
- Material based design of highly complex parts
- Knowledge & simulation based process optimization before prototyping
- Knowledge & simulation based material development

Energy storage (e.g. LH2)

Structure (e.g. space frame for the Steyrer 1050 car)

Drives (e.g. in-wheel motor)

Light weight, light alloy space frame

Design and optimization of loads transfer in structural joints (metal + metal; metal + fibre reinforced polymers .... riveting; adhesive bonding; „IGEL“ technology, …)

Structural design (with focus on static stresses, crash deformation, energy absorption) of (hybrid) space frame technology using sheets, cast rods, extrusions of Aluminium & Magnesium alloys

( Hybrid) shape casting of space frame joints

Utilisation of materials concerning special properties e.g. local energy absorption by folding

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Energy absorption

LKR has a long history in design and optimization of crash energy absorbers (incl. bullet proof materials), starting from Aluminium & Magnesium foam technologies over foam filled steel profiles, heat treatment studies of conventional alloys with higher energy absorption to simulation based deformation design of space frames or purpose built crash absorbers.

Hollow extrusions as energy absorbers

Conventional high strength Al alloys usually show different grain sizes and precipitations (resulting in different mechanical properties) due to insufficient cooling rates along the thickness of the walls.

→ The coupling of FEM (Procast, LS-DYNA) & analytical tools (based on MatCalc) for the optimization of energy absorber properties on microscopically and macroscopically levels will offer a method for the best utilization of properties of profiles manufactured by industrial processes.

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Virtual crash performance studies of design iterations for the crash energy absorption of heavy battery packs

Energy storage & containers

LKR was / is / will be cooperating with different companies/consortia concerning design, prototyping & evaluation of

- a non-cylindrical liquid hydrogen tank
- a cylindrical gaseous hydrogen pressure tank
- a non-cylindrical solid-state hydrogen container
Electric drives & range extenders

LKR will be cooperating with different companies/consortia concerning design, prototyping & evaluation of components of

- in-wheel drives
- range extender engines

Additional topics

LKR is currently studying

- Light alloys for usage in batteries as an anode (Magnesium-Air-concept)
- Contamination of light alloy scrap by Lithium from batteries (causing e.g. Brittleness in Aluminium products)
Outlook & Conclusion

- The LKR Leichtmetallkompetenzzentrum Ranshofen GmbH forms the Business Unit Light Metal Technologies Ranshofen of AIT’s Mobility Department.

- LKR is advancing its long lasting expertise in order to meet the challenges of new electric vehicles.

- LKR is cooperating with many different Austrian companies on topics like light weight structures, energy storage or drives.

- LKR contributes to AIT’s efforts to develop appropriate solutions for the environmentally compatible, efficient and safe mobility of the future!