Abstract/Description

- The proposed technology is based developing TISICS filament wound titanium metal matrix composite technology and space robotics technology to enable high performance (positional accuracy and load capacity) robotic systems for demanding and hazardous environments.
  - Space manufacturing and exploration will need lightweight machinery to enable feasible and economic launch. These systems will need to be very robust and resilient against space radiation, thermal cycling, micro-meteorite impact and abrasion (Mars) without maintenance and repair.
  - Fusion reactors need robotic system which are highly accurate and controllable which can survive high temperature, magnetic fields and radiation with limited scope for repair once exposed to the fusion process.
  - Deep water exploration needs highly reliable robotic systems which can be remotely operated with high accuracy and are capable of surviving very high pressure, cold, salt water and biological attack.
- All of the above need systems which can carry high loads or apply loads with multiple manipulators using relatively low power

Metal Matrix Composites offer corrosion resistant, high and low operating temperatures, low activation energy and non-transforming alloys, which have twice the specific strength and stiffness of conventional metals but can be machined, welded or assembled with bolted fastenings.

Original/Potential Field of Application

- The technology was developed for the Space exploration sector for future In a Mars and 'New Space' applications where there is no risk of outgas coupled with very high performance.

- The technology could have the following fields of application.
- Fusion reactors will need robotic systems to operate inside the magnetic field of the reactor for remote handling. High load capacity and high stiffness for precise positioning will maximise the operation of this system. Non-magnetic, capacity for high temperature, radiation resistant materials will be beneficial.
- Deep water robotics- High pressure/corrosion
- Arctic / desert conditions cane be accessed in a safer way with robotics.

Proposal SWOT Analysis

Strengths

- Unique material properties
- European material source
- Prior experience working with Big Science Centres
- Prior experience developing robotics
- Potential for science and commercial exploitation

Weaknesses

- TISICS develops and makes mechanical parts and would need robotic expertise to develop this
- TISICS needs big Science support to provide application requirements
- TISICS needs access to specialist testing facilities especially radiation and environmental test cells

Opportunities

- International collaboration
- Supports existing big science facilities therefore requirements can be set and end user customers identified
- Potential for testing within existing facilities and hence broader partner opportunities.

Threats

- Non-European robotics solutions have greater access to R&D and initial application funding (USA via SBIR/Tittle 3 defence funding.
- Lack of knowledge of metal composites leads to development of a less functional material solution and then inertia for future change

IPR Status & Contact Information

- The IPR status of the technology is
- TISICS owns the reinforcing fibre process technology and 'know-how' IP.
- TISICS has proprietary know how for design and manufacture of metallic composites
- Robotic design – open no restrictions
- Application IP rests with Big Science institutes
- New use of material in these applications coupled with control technology could create new IP for the development consortium.

- For further information, the contact point is Stephen Kyle-Henney
- TISICS limited
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- The company/research institution basic information is
- ESA?
- CERN?
- Institutes with expertise in Robotics or need for robotics.