

An Indian-Australian research partnership

Project Title: **Micro Electro Mechanical Sensor (MEMS) for Hydraulics**

Project Number **IMURA0460**

Monash Supervisor(s) **Tuncay Alan**
tuncay.alan@monash.edu *Full names and titles*

Monash Department: **Mechanical & Aerospace Engineering** *Full name*

IITB Supervisor(s) **V Ramgopal Rao**
rrao@ee.iitb.ac.in *Full names and titles*

IITB Head of Department: **A Karandikar**
karandi@iitb.ac.in *Name, Email,*

IITB Department: **Electrical Engineering** *Full name*

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. Nanotechnology

The research problem

Operating cost and increased environment constraints are forcing industrial equipment operators look for better online monitoring systems to improve optimum flow and increased service life of hydraulic systems. Realising this without compromising on the performance and component life demands sophisticated online monitoring systems. The online monitoring system should be able to reduce the delay associated with offline analysis, decrease response time, meet the space constraints and provide smart decision making. MEMS devices has potential application in this area. A rugged MEMS device which can monitor hydraulics and lubricating oils in industrial environment would be needed. A MEMS device capable of monitoring contamination based on standard fluid contamination guide lines will have to developed.

A proper assessment of fluid contamination in laboratory addresses 1) particle count 2) Water content 3) Viscosity 4) Additive content and 5) Acid or base content. Capability of a MEMS device to monitor all these need a good research and development.

Some of the key challenges to develop such MEMS device would be as follows

- The environment condition that this device to withstand
- Positioning of these device in the component such as motor, pump and valves
- Communication with external world

Project aims

Develop a MEMS device to monitor hydraulic fluid conditions in real time in a component such a pump/valve.

The MEMS device should with stand all the environment conditions

The device should be able to communicate to the real world

Expected outcomes

- MEMS sensor architecture
- Demonstrate a working MEMS device in hydraulic device (pump/motor/valve)

How will the project address the Goals of the above Themes?

This will involve Nanotechnology, simulation and manufacturing of the sensor

Capabilities and Degrees Required

- Electrical or electronics engineering
- Microelectronics
- Nanotechnology
- Modelling & Simulation
- Manufacturing
- Understanding of hydraulic components and systems

Potential Collaborators

Microelectronics department
Signal processing

Major Milestones:

Please add major intended milestones for the project

| # | Milestone | Deliverable | Timeline | Responsible |
|---|-----------------------------|----------------------|-----------|--------------|
| A | • Literature survey | Report | 06 months | Student/Prof |
| B | • MEMS architecture | Report | 06 months | |
| C | • MEM development & testing | Report, MEMS sensors | 12 months | |

| | | | | |
|---|--|--------|-----------|--|
| D | • Prove on an real world example & testing | Report | 12 months | |
|---|--|--------|-----------|--|