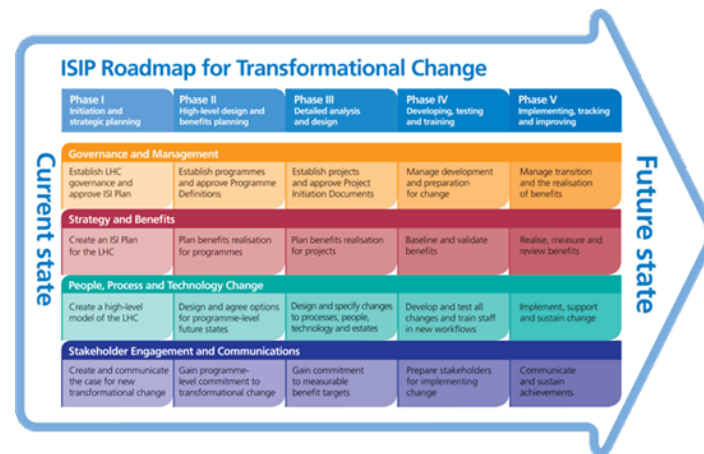


# Sheet Metal Engineering Research Roadmap

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# Research Roadmap Objectives

- Well established Sheet-Metal Industry in NZ
- Products as well as machinery
- Export share is low
- Innovative products and sector development needed
- R&D roadmap useful tool in business-planning
- Prioritise R&D projects and secure funding



# Industry Sectors

- Building Products
  - Roofing
  - Wall Cladding
  - Framing
  - Fencing
  - Heating and Ventilation
  - Doors
- Materials Handling/Transport
  - Road based transport
  - Marine transport
  - Containers
  - Tanks
  - Shelving
  - Food handling



# Industry Sectors cont.

- Manufactured products
  - Furniture
  - Appliances
  - Cabinets
  - Tools (e.g. saw blades)
- Agricultural
  - Agricultural Machinery
  - Sheds



# Research Providers – Tertiary Sector

- AUT Metal Forming Centre
  - Forming centre
  - Friction stir welding
  - Metallurgy
- University of Auckland
  - Nanotechnology
- University of Canterbury
  - To be explored
- University of Waikato
  - Nanotechnology



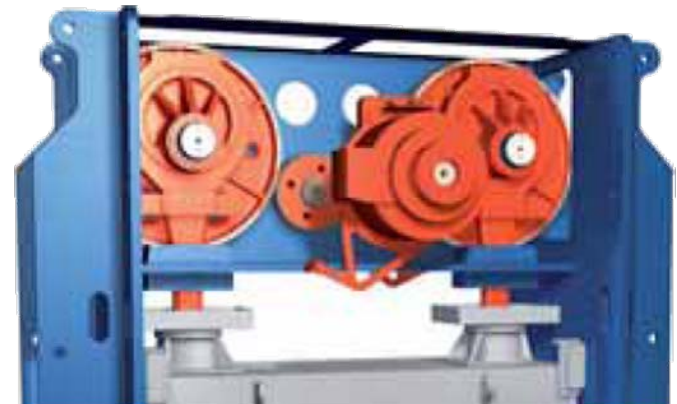
# Research Providers cont.

- Industry and private research providers
  - HERA
    - Composite Structural Assembly (CSA) research joint venture
    - Structural Design Group (Structural Steel, NASH support)
    - New Zealand Welding Centre (welding, joining)
  - BRANZ
    - Corrosion
  - NZ Steel (link to Bluescope steel research capabilities)
- Polytechnics
  - Sheet metals engineering trade
- CRI's
  - IRL (Material Focus, Corrosion)

# Trends in Sheet Metal Engineering

## Forming Technology

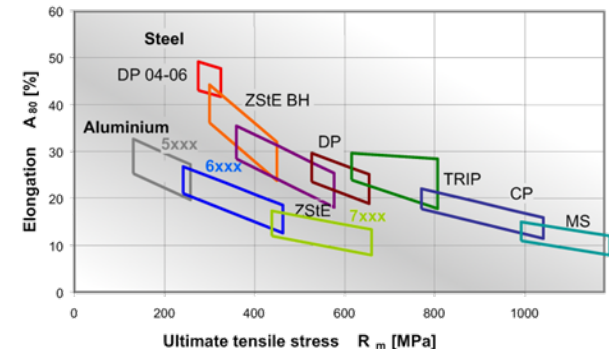
- **Press forming trends**
  - Servo presses combining the low running costs and reliability of mechanical presses with the flexibility of hydraulic presses.
- **Roll forming trends**
  - Flexible roll-forming to produce curved shapes
- **Forming processes becoming faster as a result of productivity requirements**
  - High degree of automation, transfer of parts between presses and stations done by robots
- **Hydro forming**
  - Increase the forming limit of existing materials while at the same time
  - Reduced tooling costs due to the omission of exactly manufactured die
  - Higher accuracy
  - Higher surface quality as there is only tool contact on one side
- **Hot Metal Gas Forming**
- **Flexible blankholders**
  - Increase flexibility of presses



# Trends in Sheet Metal Engineering cont.

## Material Developments

- Emerging of advanced high strength steels with UTS of up to 1700 MPa
  - Challenge for tool material as material increases tool wear
  - Leads to possible reduction in material thickness
- Reduction of wall thickness (cost & sustainability perspective) – e.g. inclusion size becomes an issue
- Plastic laminated steel sheets
  - One side plastic coated
    - Increase corrosion performance of sheet material
  - Plastic layer in the middle of two steel sheets
    - Adjustable vibration behaviour
    - Formable like traditional steel
    - Weldable
    - Recyclable





# Trends in Sheet Metal Engineering cont.

## Fabrication Developments

### Joining technology developments

- Mechanical joining – no consumable cost
  - High reliability of joints
  - Joining of dissimilar products
- ‘Cold’ welding processes e.g. MIG brazing
- Laser welding
  - cost reductions
  - less consumable cost
  - narrow heat affected zone (HAZ)

# Other Emerging Technologies

- **Coatings developments**
  - Water based coatings
  - Printing on steel – precision lithography
  - Anti-graffiti performance
- **Composite research**
- **Nanotechnology**
  - Adjust material performance through nano-alloying

# Development Opportunities

## – Sector overarching

- Durability/Corrosion
  - Fastening systems
  - Exposed and structural elements
- Joining systems
  - Consumable free fastening systems
  - Penetration free attachment systems
  - Seamless joints – no overlaps
- Coatings
- Composites - Laminated products

# Development Opportunities cont.

## – Building Products

- Roofing

- Purlin free roofing systems
- Long span
- Structural Roofs (truss-less)
- Penetration free roof cladding
- Integration of additional functionality into existing roofing systems
  - » Photovoltaic coatings
  - » Solar heat collectors air based
  - » Solar heat collectors water based
  - » Insulation
- Building solution
- Curved roofs



# Development Opportunities cont.

- **Wall Cladding**

- Structural walls
- Decorative walls
- Explosion/blast resisting walls
- Pre-fabricated walls
- Load increases for items hanging off walls
- Noise reduced wall systems

- **Framing**

- Reduced steel usage and increased strength
- Building steel systems research
- Different cross sectional area members
- Transverse forming
- Modular construction
- Prefabrication
- Thermal efficiency increase (integrated thermal brakes)
- Composite steel frame

# Development Opportunities cont.

- **Heating and Ventilation**
  - Hollow steel elements as conducting elements
- **Doors**
  - Garage doors with increased stiffness
  - Composite doors
  - Commercial doors

# Development Opportunities cont.

## – Materials Handling/Transport

- **Road based transport**

- Road barriers
- Removable road barriers
- Conical lamp post

- **Containers**

- Steel pallets (re-usability)
- Square containers

- **Tanks**

- » Water tanks
- » Containerised tanks
- » Collapsible tanks (Australia)

- **Shelving**

- Understanding performance and steel grade relationship
- Be part of the building structure

- **Food handling**

- Coating developments

# Research Requirements



## Sector Overarching

- Sustainable Steel
  - Improving environmental foot print of the NZ steel based manufacturing industry (5-10 year sector overarching R&D program?)
  - Improving Energy Efficiency of Steel Based Building Products
    - Thermal Breaks in Steel Frames
    - Laminated Steel Sheets
    - Composite Structural Assemblies with focus on thermal efficiency
  - Durability/sustainability of steel coating systems
    - Understanding and improving existing products
    - New coating systems



# Research Requirements cont.

- Increasing productivity
  - Manufacturing Technology
    - Metal forming
    - Assembly/joining
    - Cutting
  - Business practices
  - Providing skilled workforce

# Research Requirements cont.

## Sector specific

e.g. Light Steel Framing

- Treat steel frame and cladding systems as composite
- Different cross sectional area members
- Prefabrication/modular construction
- Thermal efficiency increase (integrated thermal brakes)
- Consumable free joining techniques (mechanical joints)

# Where to from here?

- Further investigation of New Zealand industry needs?
- Individual R&D development projects?
- Applications for funding?
- Consortium approach?

