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
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?