R&D Infrastructure for Sustainable Growth of Remanufacturing Industry

Submitted by: Singapore
R&D Infrastructure for Sustainable Growth of Remanufacturing Industry

Dr Bin SONG
Sustainable Manufacturing Centre (SMC)
Singapore Institute of Manufacturing Technology
A*STAR
bsong@SIMTech.a-star.edu.sg

Mission

Mission: To develop and implement innovative technologies that minimize emissions, waste, and toxicity in manufacturing, and strengthen the global competitiveness of Singapore’s manufacturing industry.

Roles:

Promotion & Training
- Conferences
- Seminars/Workshops
- WSQ Graduate Diploma
- Training courses
- Outreach programs

Research & Development
- Research programs
- CRP/In-house projects
- Research Planning & Roadmaps

Industry Development
- Focus Industry initiatives
- Collaborative industry projects
- Technical solutions/Services
Sustainable Manufacturing Domain & Initiatives

- Assessment & strategizing
- Monitoring & Optimization
- Energy Recovery
- Energy Efficient Technologies

Sustainability Measures & Management
- Life Cycle Assessment
- Cost analysis
- Sustainability Strategy and planning

Regulatory/Policies
- Remanufacturing
- Green Packaging
- Recycle waste
- Zero-waste Manufacturing

Eco-design

Energy Efficiency

Material Efficiency

Remanufacturing:
-A Key Approach Towards Zero Waste Manufacturing

Nature

Materials → Manufacturing → Products → Usage → Waste

Reuse

Recycle

Testing/QA

Remanufacturing

Collect-back

Disassembly

Salvage

Inspection

Cleaning

Disposal

Assembly
Remanufacturing in Singapore

• By strict definitions, we have only a few remanufacturers
• In broader definitions, we have a well-established repair and overhaul industry for Marine Vessels, Aircrafts, Equipment, and other products.
• With right policies/support, high potential for growth from MNCs, product distributors, and precision engineering companies.

Approach to Develop Reman Industry

• Develop a strong supplier-base for remanufacturers
• Promote upgrading from repair/overhaul to remanufacturing
• Assist product manufacturers/distributors to incorporate remanufacturing
Enablers for Remanufacturing Growth

- Remove trade barriers for movement of used/remanufactured products cross borders
- Introduce policies to encourage OEM and 3rd Party collaboration in remanufacturers, and 3rd Party to become remanufacturers
- Establish an accreditation system to verify and certify remanufactured products for user acceptance
  - Operations
  - Parts
  - Products
- Develop new technologies to enable environmental-friendly and cost-competitive remanufacturing

Technical Challenges of Remanufacturing

- Environmental-friendly transportation, inventory, disassembly, cleaning, and salvaging of used products
- From skill-based to technology-enable remanufacturing
Concerted Effort in Singapore

- SERC/A*STAR Innovation in Remanufacturing Research Programme
  - Driven by industry needs/gaps
  - 10 projects covering reliability/quality-assurance, new salvaging technologies, and remanufacturing operation
  - 2-3 years with reserved co-funding to support industry collaboration
- SIMTech-NTU Joint-lab on Reliability
  - R&D of NDT-based methodologies/technologies for pre-qualification of used parts/products and post-qualification of remanufactured parts
  - Verification and services for remanufacturers
- Remanufacturing Initiative of SMC/SIMTech
  - Introducing new/improved technologies to remanufacturers
  - Developing new remanufacturers
  - Assisting remanufacturers to localize supplier-base
- Advanced Remanufacturing & Technology Centre (ARTC) of Singapore
  - Membership-based non-competitive consortium
  - Member-driven research and development
  - Dedicated resources and Government funding

Remanufacturing Initiative

<table>
<thead>
<tr>
<th>Direct Supply of REMAN Components</th>
<th>Services (Indirect)</th>
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<tbody>
<tr>
<td>Disassembly</td>
<td></td>
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<tr>
<td>Cleaning (oil, painting, dirt, rust, carbon deposits, etc.)</td>
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<tr>
<td>NDT for used part inspection</td>
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<tr>
<td>Qualification of Reman Parts</td>
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<tr>
<td>Reliability Certification of Reman Parts</td>
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<tr>
<td>Welding (inert-gas, spark, friction, etc.)</td>
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<tr>
<td>Laser Cladding</td>
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<td>Surface Treatment</td>
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<td>Peening</td>
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<td>Coating</td>
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<td>Heat treatment</td>
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<td>Reverse Logistics</td>
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<td>Reman Inventory Management</td>
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- Objective:
  - Enhancing remanufacturers’ competitiveness
  - Develop remanufacturing related capabilities in local companies
  - Growing remanufacturers in Singapore

- Members:
  - Remanufacturers
  - Service providers
  - Companies interested in venturing into remanufacturing

- Core Functions
  - Networking & Business Matching
  - Knowledge sharing and training
  - Technical Assistance
  - Partnership projects

11 Founding Members

SIMTech/A*STAR
Re-manufacturers (Caterpillar)

Suppliers

EDB/Spring/WDA

ACG Metal
Arabtec
GT Industrial
Hewlett Packard
SDDA
Vilhelms
Thank You

B. Song
Sustainable Manufacturing Centre
Singapore Institute of Manufacturing Technology
Email: bsong@simtech.a-star.edu.sg