

# Consensus opinion on issues in manufacturing implementation

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- Surface preparation **90 VOTES**
  - Environmental cleanliness and control, contamination
- Cure control **40 VOTES**
  - Local variations in temperature and pressure, porosity
- Dimensional control (adhesive layer thickness) and Bonding Fixtures **39 VOTES**
  - Dimensional control of substrates, verification of fit
  - Application of preloads, bondline thickness control, defects
- NDI/quality control **32 VOTES**
  - Cured bondline evaluation, tracking outcome and bond process variables
- Scaling of processes to larger/smaller structures **26 VOTES**
  - Scaling of a developed process to a larger (smaller) structure
- General (Human Factors) **25 VOTES**
  - Equipment maintenance, training of personnel, documentation of process, handling/storage/disposal of materials
- Handling of the adhesive **13 VOTES**
  - Storage, aging
- Dispensing adhesive **4 VOTES**
  - Sequence and timing of bonding process steps, gap filling

**MANY WERE UNCOMFORTABLE WITH THE CONCEPT OF RANKING**

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- Surface preparation **90 VOTES**
  - Environmental cleanliness and control, contamination
    - TRAINING
    - Controlled environment
    - NDI does not answer everything

# Consensus opinion on issues in manufacturing implementation

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- Cure control **40 VOTES**
  - Local variations in temperature and pressure, porosity
    - Does equipment work?
    - Scaling
- Dimensional control (adhesive layer thickness) and Bonding Fixtures **39 VOTES**
  - Dimensional control of substrates, verification of fit
  - Application of preloads, bondline thickness control, defects
    - Tooling Design
    - Use Verifilm appropriately – useful for gross evaluation only

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- NDI/quality control **32 VOTES**
  - Cured bondline evaluation, tracking outcome and bond process variables
    - Necessary but not sufficient
    - Difficulty/costs in getting standards
    - New developments such as power ultrasonics, sonic IR
    - Visual inspection is valuable, but needs standards
    - Process data not being fully utilized when gathered
- Scaling of processes to larger/smaller structures **26 VOTES**
  - Scaling of a developed process to a larger structure
    - Size, complexity, and number of steps increase dramatically
    - Formal procedure of Manufacturing Risk Articles to minimize risk

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- General (Human Factors) **25 VOTES**
  - Equipment maintenance, training of personnel, documentation of process, handling/storage/disposal of materials
    - TRAINING
      - Even when done well, sometimes not absorbed/obeyed
    - Automation
    - Documentation of Processes
- Handling of the adhesive **13 VOTES**
  - Storage, aging
    - Shipping vs Manufacturing Date/ Out-time / Requalification
- Dispensing adhesive **4 VOTES**
  - Sequence and timing of bonding process steps, gap filling
    - Mixing

# Summary

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- Everybody knows what the big issues are, and there is even rough consensus on prioritization
  - Many were uncomfortable with the concept of ranking
  - People have techniques to cope with the current situation, but nobody is fully comfortable
- Two topics where the comfort level is lowest
  - TRAINING
    - Not done well enough consistently enough often enough
  - SURFACE PREPARATION
    - Most in need of good practical solution(s)