Performance and test methods for corrugated board packaging
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Goal of the project "Standards for optimizing corrugated board packaging for exporting industry"

- A foundation for development of a future standard allowing more optimized and resource efficient use of corrugated board packaging for product protection
- Investigation of the problems occurring and identify the needs of the exporting industry
- Investigation of existing standards and test methods and comparison to the needs of the industry
Background

- Corrugated board varies within the same quality, depending on where in the world it is bought
- There are numerous test standards, but little help or guidance on which properties are important
- Lack of a global performance standard means that large packaging users, i.e. exporting companies, cannot easily specify their needs when communicating with corrugated manufacturers
Participating companies and their products
- wants box performance

Goods producing companies:
- Duni
- Ericsson
- SKF Mekan
- Gambro Lundia
- McNeil
- ESAB
- Xylem Water Solutions

Products:
Also some suppliers participate
- sells mainly on paper properties

Producers:

Products:
Activities in the project

- Mapping of demands
- Mapping of existing standards
- Analysis
- Proposal for future work
Mapping of demands – Questionnaire for interview

- Types of damages, where they occur in the distribution chain, and how they are followed up
- Damage frequency and statistics, influence on packaging development
- Test methods used on boxes and pallets
- Organization of packaging development, e.g. if development is performed in-house or externally by packaging supplier or consulting companies, and if the responsibility lies on product, division or central level.
- The requirements on primary and secondary (transport) packaging and if they are evaluated together or independently of each other
- Use of packaging instructions; pallet pattern and marking
- Important environmental factors to protect against and how are these determined
- Specification on corrugated at purchase
- Quality control of delivered packaging material (Some of the questions….)
Mapping of demands – Workshop
Identified problems

- **Logistics**
  - Varying transport distances
  - Mixed cargo, single parcel or pallet
  - Pallet optimisation and securing

- **Stackability and side impact**
  - Collapse due to shocks and vibrations
  - Creep
  - Perforations

- **Climate, especially humidity**
  - Performance loss
  - Creep at varying humidity
Mapping of existing standards

Paper properties

- Tensile stiffness
- Tensile strength
- Short span compression test (SCT)
- Corrugated medium test (CMT)
- Dimensional stability

Corrugated board properties

- Edge crush test (ECT)
- Flat crush test (FCT)
- Bending stiffness
- Friction
- Printability
- Burst strength
- Warp

Box performance

- Box compression test (BCT)
- Rough handling protocol
Standardized methods
- paper/board level  box level  pallet level  reality

Bending stiffness
(ISO 5628)

Box compression test
(ISO 12048, ASTM D 642)

Transport test
(ASTM D 4169)

How to reflect real life?
Examples of test methods - paper level

Corrugated Medium Test (CMT)

Corrugating medium - Determination of the flat crush resistance after laboratory fluting – ISO 7263

/source: L & W /
Examples of test methods – board level (1)

- ECT (Edge Crush Test), ISO 3037
- FCT (Flat Crush Test), ISO 3035
Board level (2)
-Bending stiffness – four point bending (ISO 5628)
Board level (3)
- Burst strength (Mullen) ISO 2759

MD

CD
Board level (4)  
- Test of ink rub resistance

- ASTM D 5264-98 (Reapproved 2011) "Standard Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Tester."
- Friction
- Printability
Some examples of test methods – Box level/Pallet level

- BCT (Box Compression Test)
- Transport test (e.g. ASTM D 4169)
Non-standard method: Testing creep at varying climate
Case study: which test methods are relevant?
- No correlation between Cobb value and BCT value
Conclusions
- Lacking areas where test development is needed

- Uncertainties of stresses/loads during handling
- Effects of vibrations, shocks and creep as well as design e.g. perforation on stacking strength
- Varying climate, and especially varying humidity
- Long-time behaviour of boxes
- Algorithms or equations going from panel level to box level, i.e. to include the conversion process
Planned continuation

- Development of standards and guidelines
  - Effects of vibrations, shocks and creep on stacking strength
  - Effects of design, e.g. perforations
  - Effects of varying climate
- Possibly international project

- Interested? Please contact me!
- Thank you!