

# Bentwood Chair Production



# Wood Bending: Introduction

- Method for mass production
- Invented by Michael Thonet, approx. 1840
- Today: mainly for Chairs, Sleighs



(Snow)

Sleigh / Luge with bentwood runners

Typical bentwood chairs:

a) Thonet no. (2)14- the „Coffe-house chair“

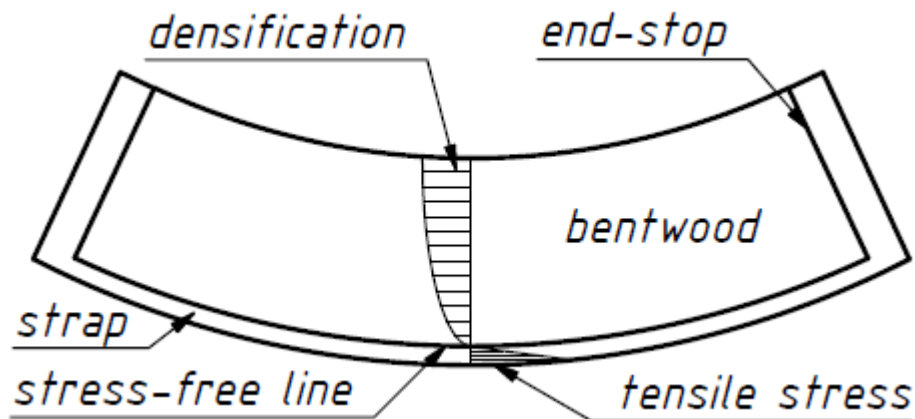
Design Michael Thonet 1850 (rear bentpart only manual bending- tools available from GHEbavaria)

b) Thonet no. (2)33- the „Beer-house chair“

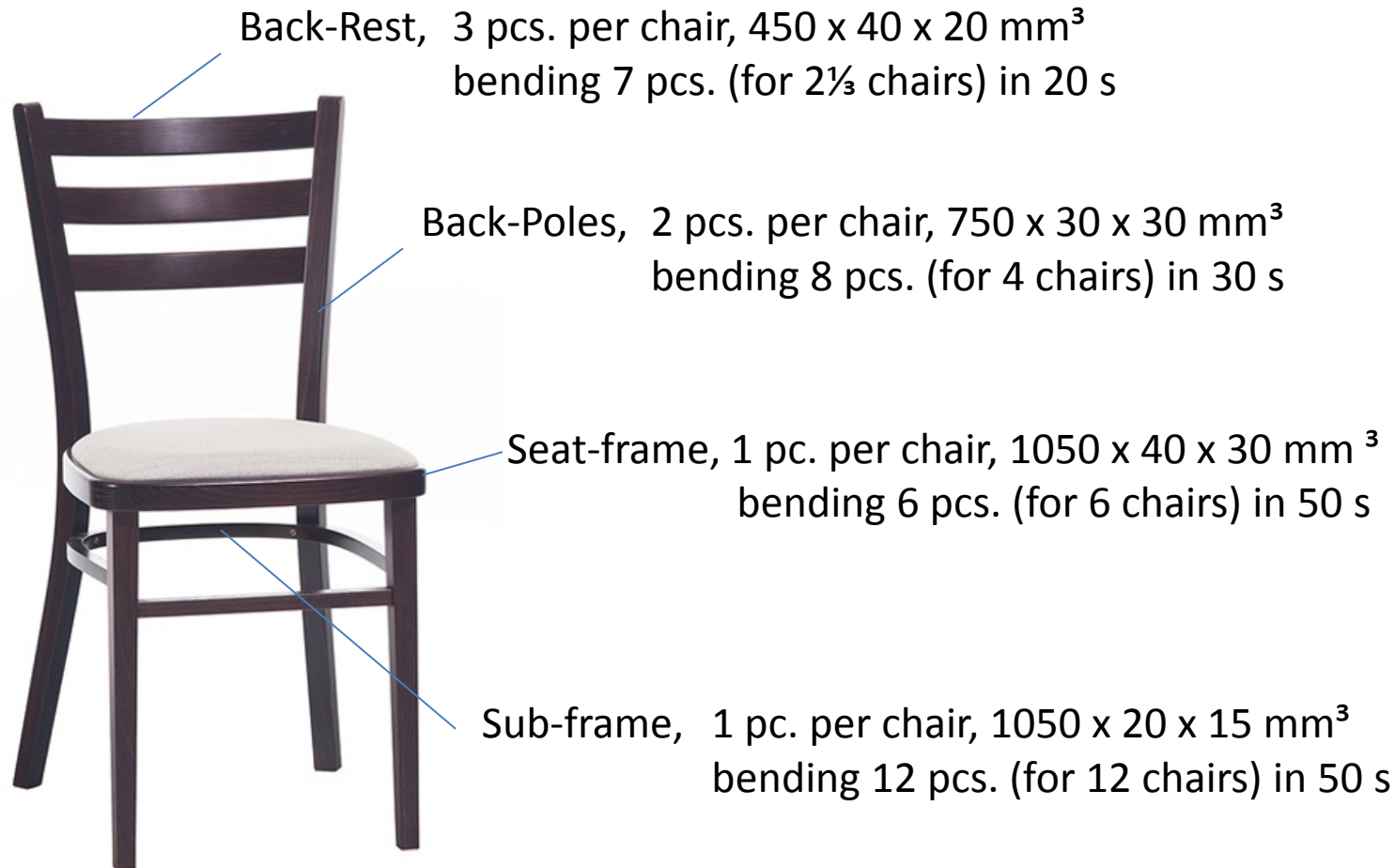
c) Thon „Tabor“

# Wood Bending: Basics

- Bending strengthens the wooden parts because:
  - › Fiber- structure remains
  - › Bending- zone is compressed
- Better mechanical properties
  - ⇒ smaller cross-sections ⇒ less wood needed
  - ⇒ lighter products



# Wood Bending: Production (1)



## Performance of a Stuzama II Solid Wood Bending Machine

# Wood Bending: Production (2)



- Working hours:
  - › Per day:  $8 \text{ h} \times 60 \text{ min} / \text{h} = 480 \text{ min. (effective)}$
  - › Per week:  $5 \text{ d} \times 440 \text{ min/d} = 2.400 \text{ min.}$
- Production time for 5.000 chairs:
  - › **back-rest:**  $5.000 \times 3 = 15.000 \text{ pcs./} (7 \text{ pcs/20 s}) = 2.143 \text{ cycl}$   
 $2.143 \text{ cycl.} \times 20 \text{ s} = 42.860 \text{ s} = \mathbf{715 \text{ min.}}$
  - › **back-poles:**  $5.000 \times 3 = 10.000 \text{ pcs./} (8 \text{ pcs/30s}) = 1.250 \text{ cycl}$   
 $1.250 \text{ cycl.} \times 0,5 \text{ min} = \mathbf{625 \text{ min.}}$
  - › **seat-frames:**  $5.000 \text{ pcs.} / (6 \text{ pcs./} 50 \text{ s}) = 834 \text{ cycles}$   
 $834 \text{ cycl.} \times 50 \text{ s} = 41.700 \text{ s} = \mathbf{695 \text{ min.}}$
  - › **sub-frames:**  $5.000 \text{ pcs.} / (12 \text{ pcs./} 50 \text{ s}) = \mathbf{348 \text{ min.}}$

## Performance of a Stuzama II Solid Wood Bending Machine

- Production time for chair type „Tabor“:
  - › Back-rests                      715 min
  - › Back-poles                      625 min
  - › Seat-frame                      695 min
  - › Sub-frame                      348 min
- Total                      2.383 min = 1 week (2.400 min)
- Required
  - › Minimum 2 strong workers to operate the machine
  - › + 1 worker @ 50% to load steamer & unload straps
  - › Sufficient number of straps & clamps
  - › 4x mould changing (@10 min / each) during break times

## Performance of a Stuzama II Solid Wood Bending Machine

# Wood Bending: Set-up

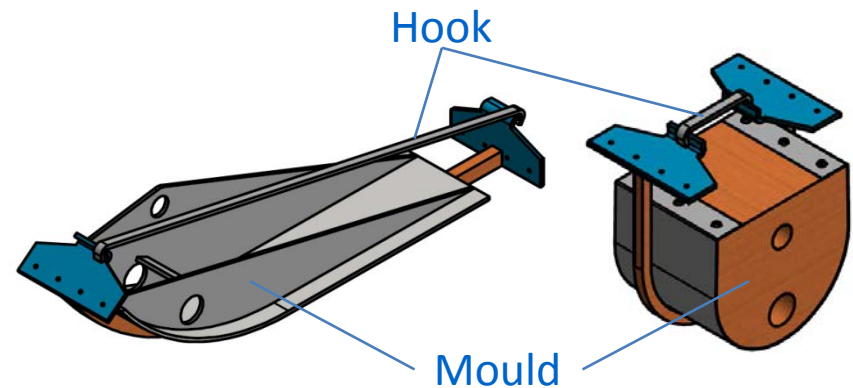
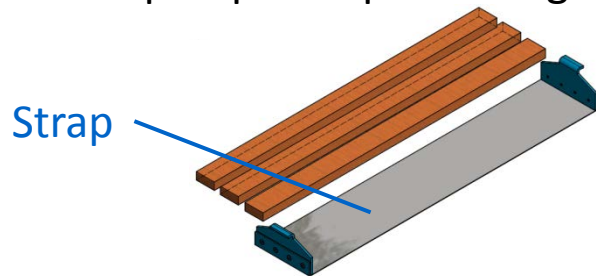
Steamer:

minimum 2 tanks for mass production

Bending machine

Tools:

- moulds (one per each geometry)
- hooks:
  - Different length for different parts
  - min. 50 pcs. per required length
- Straps:
  - according to length of workpiece
  - min. 50 pcs. per required length



# Thank You

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Information videos available at  
<http://www.youtube.com/user/GHEbavaria>

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