

# **Conveyor Belting for Underground Use**

April 2006

# AGENDA

1. Comparisons PVC vs Rubber
2. Alternatives - Carcass Designs
3. Risks - Toxicity - Smoke - Fire
4. Standards - SANS
5. Other Countries
  - AS1332 /AS1333-1994/AS4606-2000
  - ISO430
  - MSHA
  - MT668-1997/MT450-1995
  - DIN22131/DIN22120

# PVC Belting -- Sales Strategies

- No Ply Separation
- No Edge Fraying
- Lower Initial Cost
- Can Meet Proposed SANS 971 Tests
- Long Life Cycle?

# Rubber & PVC Comparison

## Advantages of Rubber

- Rubber wears 60% better than PVC
  - extended belt life
  - operational cost savings
- Rubber covers can exceed PVC's cover gauge limitation of 3-mm
  - extends belt life
  - reduces cost per ton

# Rubber & PVC Comparison

## Advantages of Rubber

- Rubber belt carcass weighs less
  - lower kN-rating requirements
  - lower kW requirements
- Rubber multi-ply is easier to vulcanize
  - lower maintenance cost
  - reduced downtime

# Rubber & PVC Comparison

## Advantages of Rubber

- Rubber covers are easier to clean
  - reduced idler wear
  - reduced wear on scrapers & covers
- Rubber's lower Durometer
  - reduced idler wear
  - reduced noise

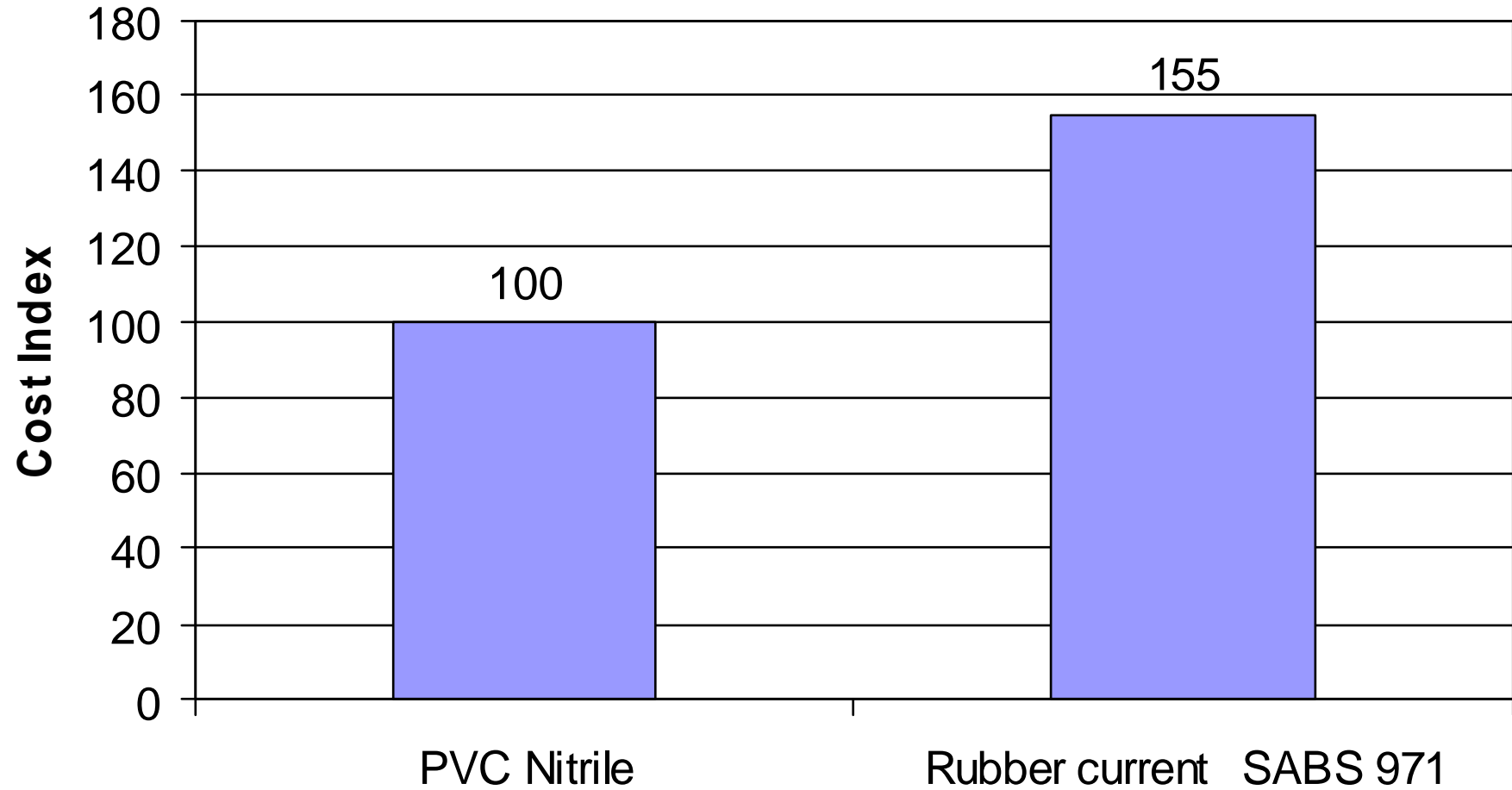
# Rubber & PVC Comparison

## Coefficient of Friction

- Rubber has a greater coefficient of friction
- Increases idler life 3 to 5 times - due to added gripping action
- Reduces the chances of drive slippage
- Increases trainability by allowing idlers to exert greater steering forces

# INITIAL PURCHASE COST COMPARISON

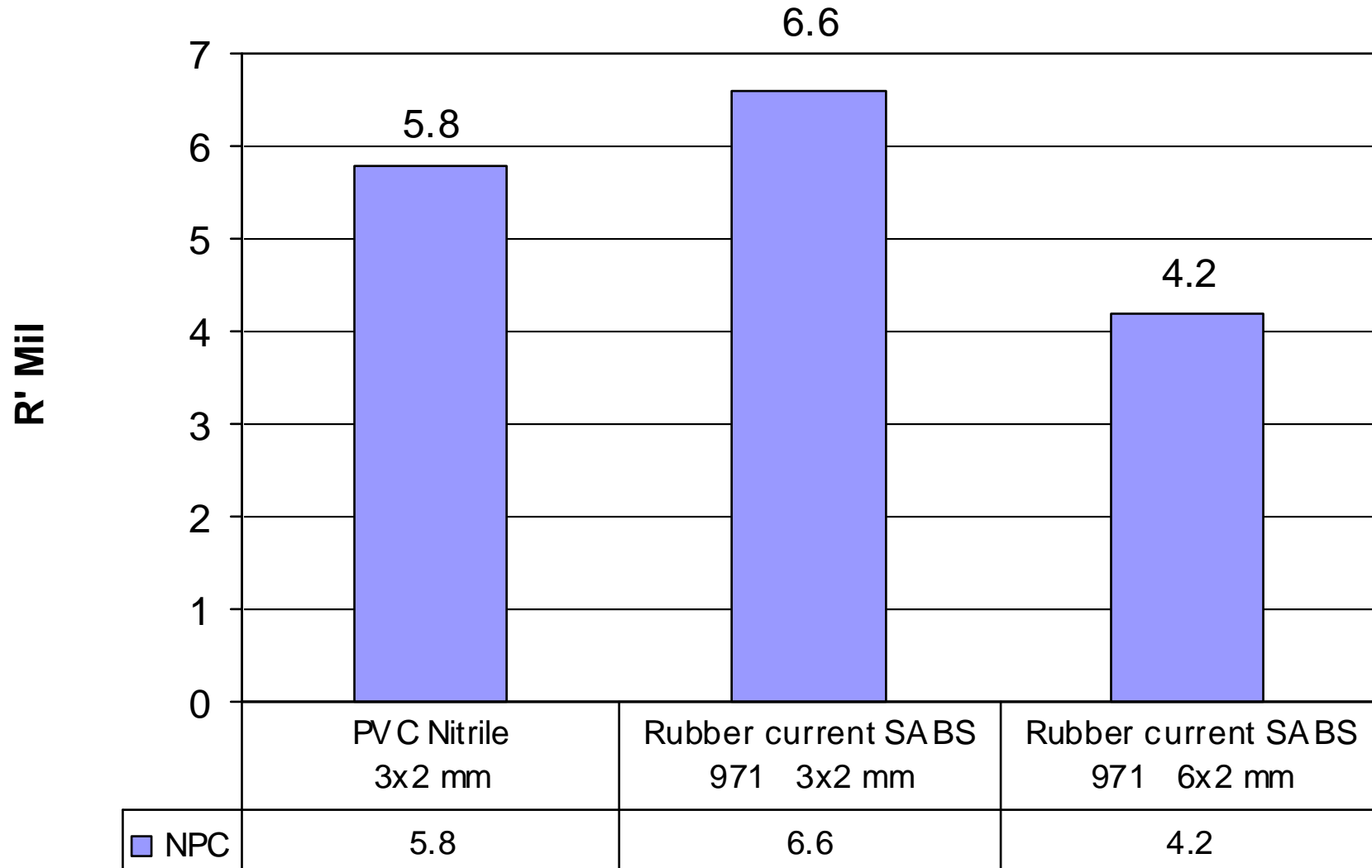
## Class 1250 3 x 2 mm Covers



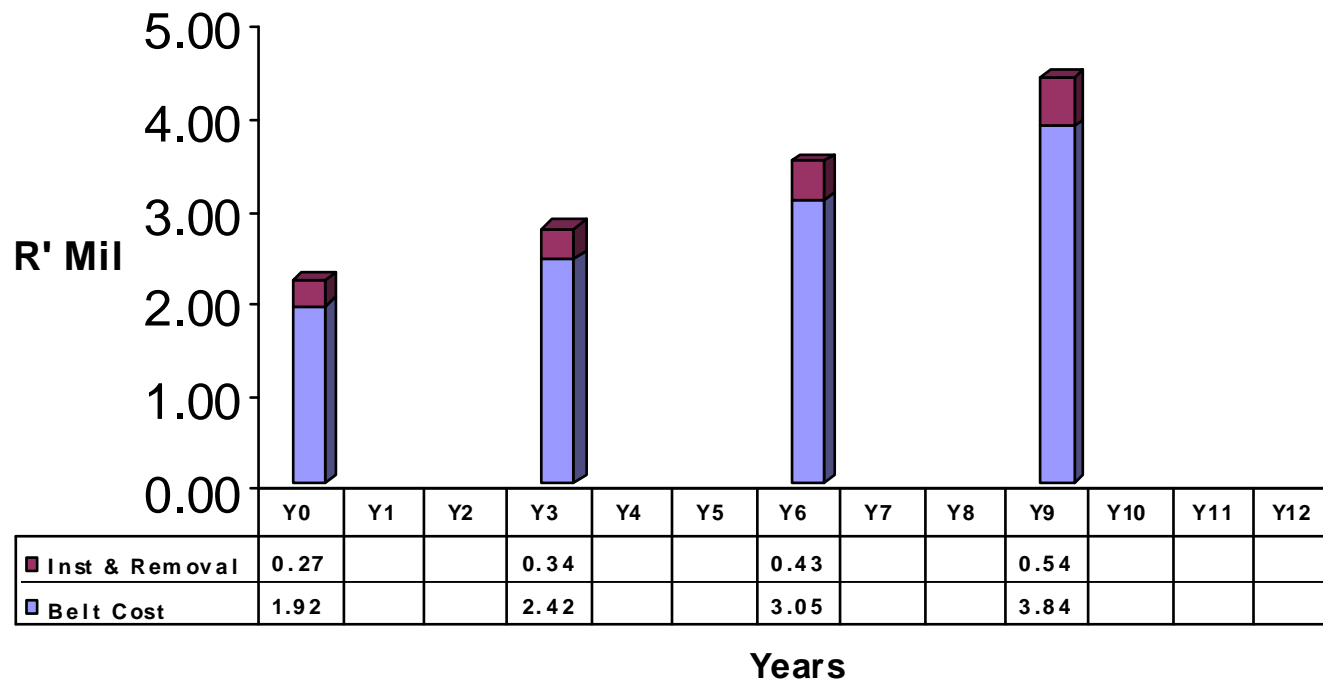
# Cash Flow Forecast Assumptions

- Conveyor Length C-C 2000 M
- Annual Tonnage 5 Million tons
- Cost escalation 8% per annum
- Discount Rate 20% per annum
- Calculation period 12 Years
- Installation & Removal costs includes transport, splicing, commissioning.
- Costs common to all products such as maintenance, inserts, joint replacement and scrapers are excluded.
- 3x2 mm covers roll length 250 m / 6x2 mm covers roll length 200 m

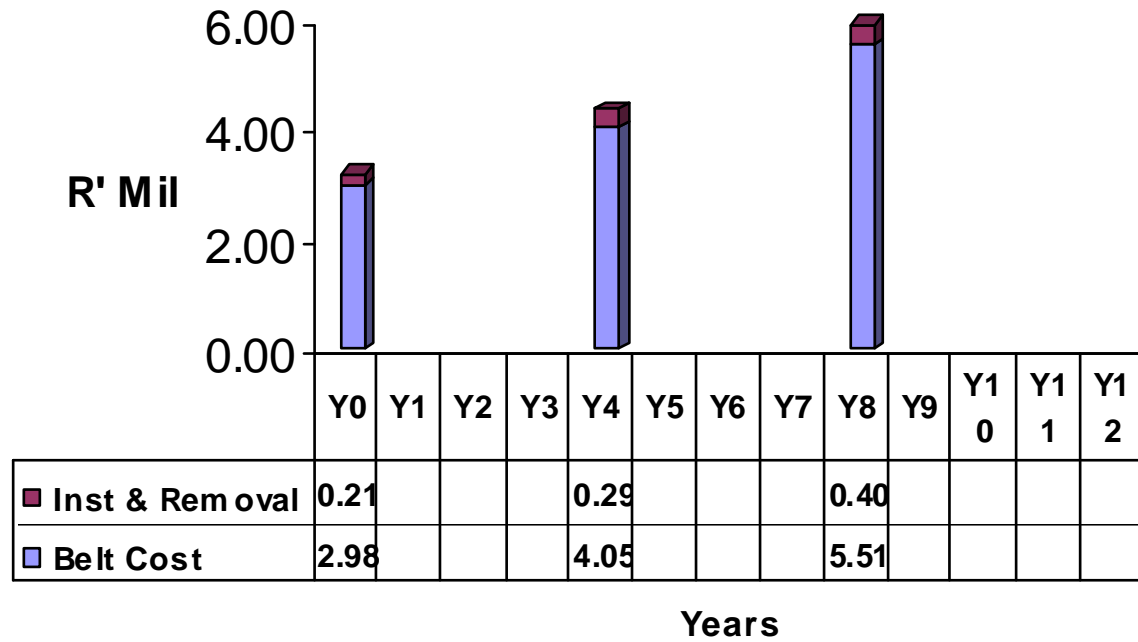
# NET PRESENT COST COMPARISON



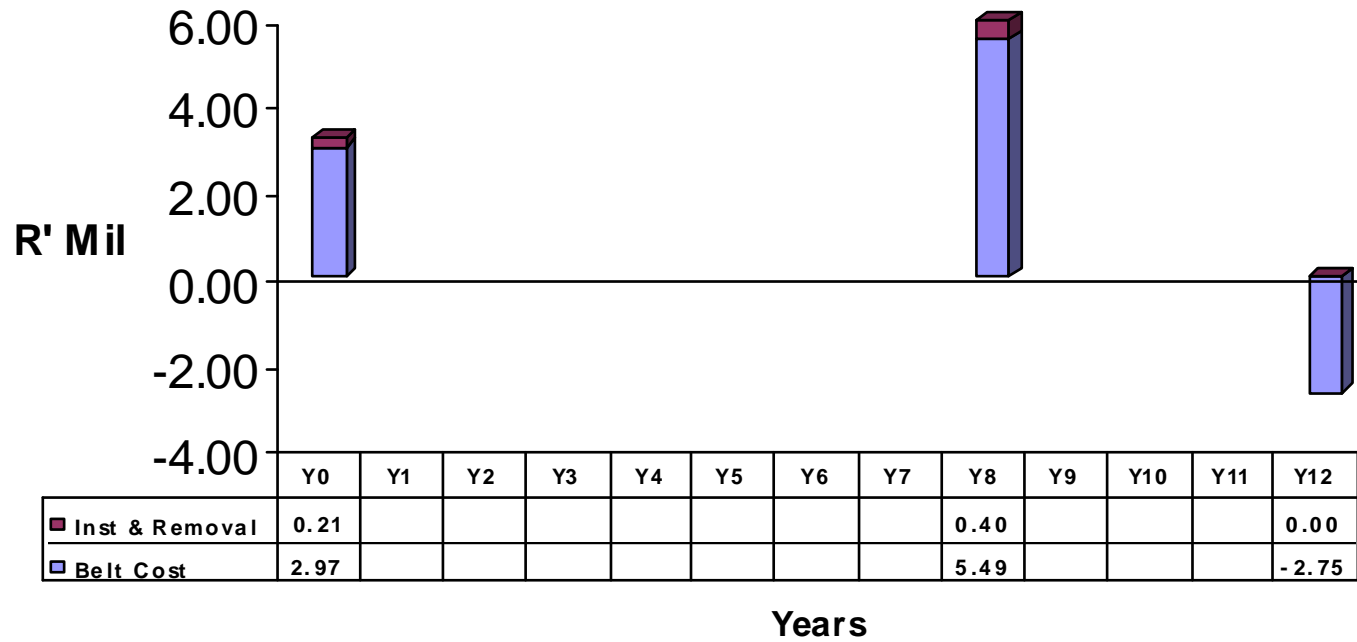
**CASH FLOW FORECAST**  
**PVC Nitrile 1200mm C1250 3x2 mm**  
**Useful life 12 - 15 M tons**



**CASH FLOW FORECAST**  
**Rubber current SABS 971 C1250 3x2 mm**  
**Useful life 18 - 20 M tons**



**CASH FLOW FORECAST**  
**Rubber current SABS 971 C1250 6x2 mm**  
**Useful life 40 - 42 M tons**



# Alternatives – Carcass Designs

**Industry Standard Construction**  
“Multi-Ply” Design



**Alternative Construction**  
“Straight”-Warp

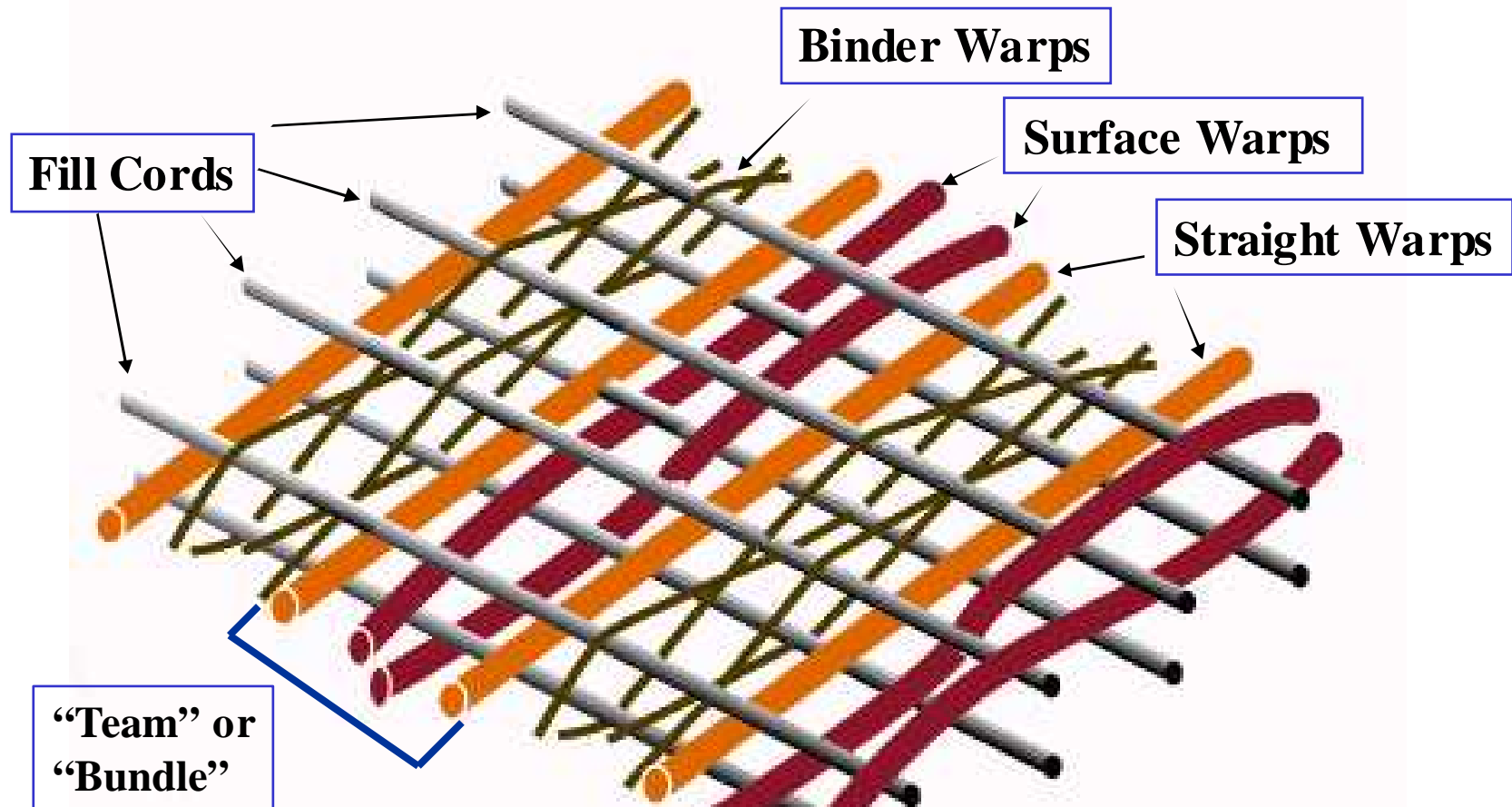


TRIPLE-WARP FABRIC

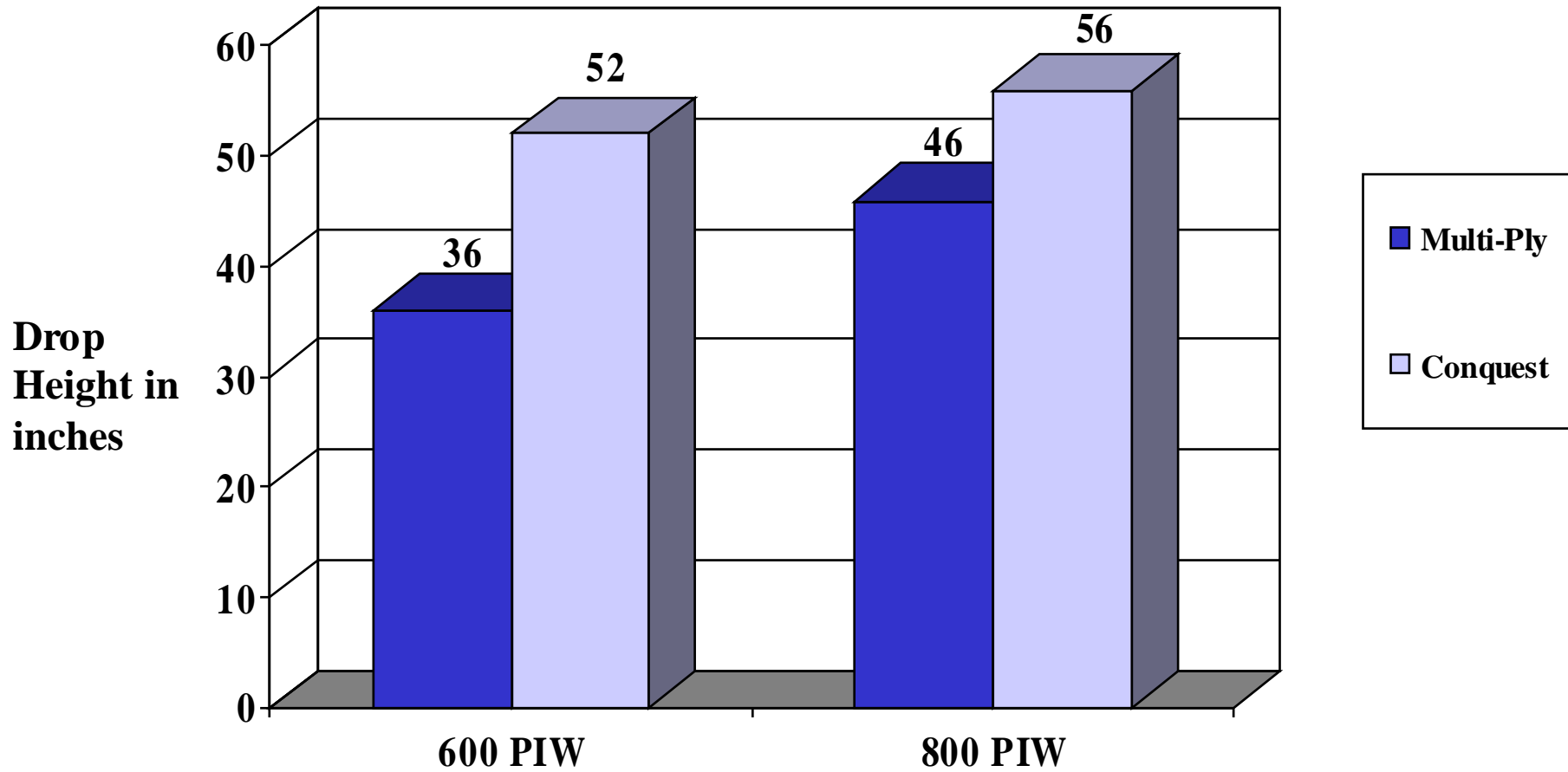
**Conquest™**  
*(Triple-Warp™)*



# Triple-Warp™ Fabric



# Impact Resistance



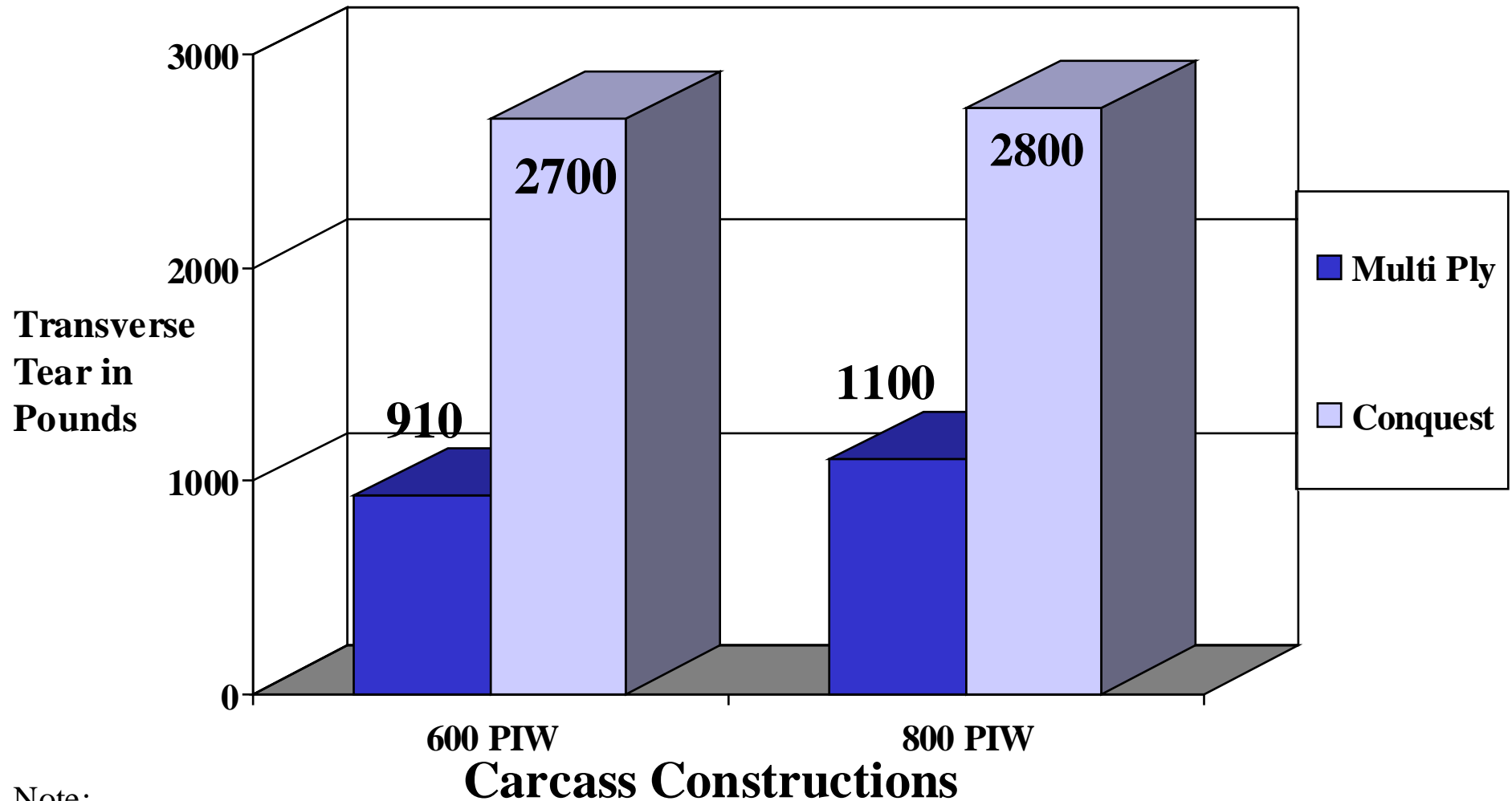
Note(s):

\* Multi Ply test belt: 4/800

\* 1" bullet head was used with 207 lb mass drop Height (in.)

## Carcass Constructions

# Transverse Tear

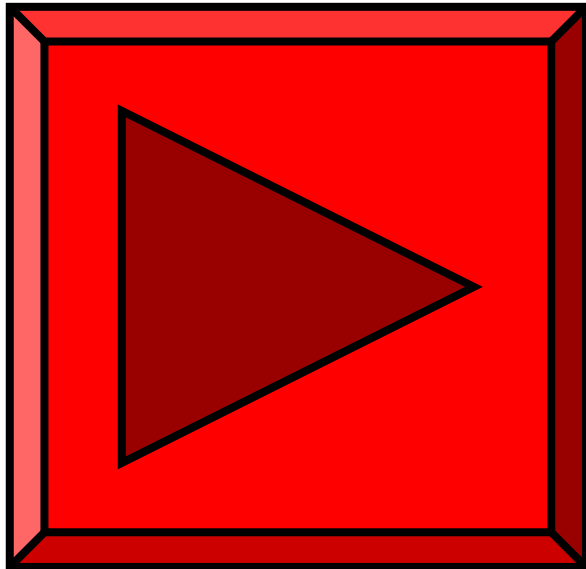


Note:

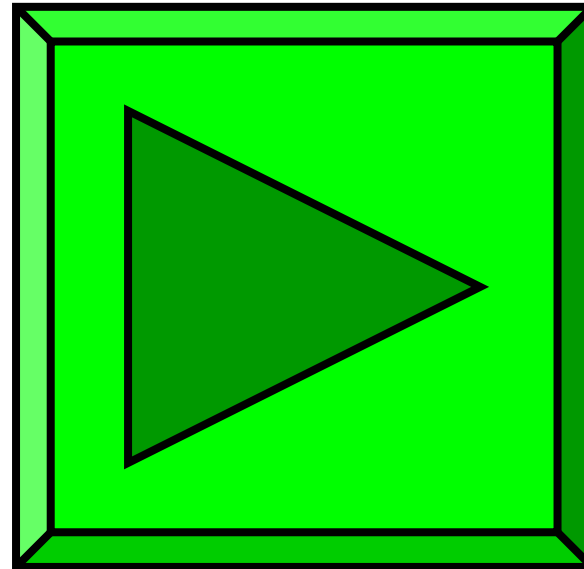
\* Multi Ply test belt: 4/800

# Risks – Toxicity - Smoke

PVC  
Drum Friction Video



Rubber Multiply  
Drum Friction Video



# Risks – Fire Hazard Assessment

- Function of Belt characteristics
- Function of Belt Installation & Operation
- Environment - Wide range of Applications
- No Single Test will give full Assessment
- Interrelated Factors need to be Considered to assess Fire Hazard for Each Situation
- Degree of Fire Hazard Varies from Extreme to Remote

## Standards - SANS 971

- SANS 971 does not distinguish whether a hazardous or non-hazardous application or allow change to classification through introduction of additional safety measures.
  - Additional safety measures would include environmental controls, such as smoke detectors, CO monitors or fail to safe instrumentation.

## Standards - SANS 971

- SANS 971 has not evaluated the toxicity of burning belts, or whether belts that have been in operation, still meet the original tests.
- SANS standards have not explored whether the Drum Friction test replicates underground belt conveyors in real life because simulation excludes pulley lagging.

# Comparison of SABS 971 to Practices in Other Countries

- SABS 971
  - Cover on test
  - Cover off test
  - Drum friction test
- MSHA
  - No drum friction test
  - **No cover off test**
- DIN 22103
  - No drum friction test

# Practices in Other Countries

- Australia – China

Three Compounds Type S, F and E

- Five Tests Applied to Determine Degree of Fire Resistance

1. Gallery Test
2. Small Scale Fire test
3. Drum Friction Test
4. Electrical resistance
5. Oxygen Index ISO4589

# CONCLUSION

**Any Questions?**