



Salient Features of Launderable PPE

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AGENDA

- Laundering
Process
- Protection
- Comfort
- Overall Cost



Sorting Process

- Rubber and cloth goods separated for specific wash formulas.
- Higher contaminated garments separated out for specialized wash cycles.
- Customer segregation maintained throughout entire process.



Decontamination Process

- Specific decontamination formulas used
- Decon chemicals delivered via computer controlled injection system
- Average wash cycle employs 7 complete independent water changes.



MONITORING

- Gas proportional detectors with optimized counting geometry.
(64 β - γ 100 cm² detectors and 24 α 600 cm² detectors)
- Computer controlled belt speed based on customer limits.
- Low activity counting capability
- Computer controlled alarm system
- Typical Limit now
<10,000 dpm/100cm²



PROTECTION

- Varying Environments
- Minimum penetration
- Durability
- Releases contamination



PROTECTION TESTING

- **Coulter Method**
- **D3786-01 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics**
- **D5034-95 Standard Grab Test Method for Breaking Strength and Elongation of Fabrics**
- **D3884-92 Standard Guide for Abrasion Resistance of Textile Fabrics**
- **D1683-90a Test Method for Failure in Sewn Seams of Woven Fabrics**
- **ASTM E96 – Water Vapor Transmission Through Materials**
- **IEST-RP-CC003.2 – Particle Penetration Test**
- **FTMS 191A, Method 5903.1 Standard (Vertical) Test Method Flame Resistance of Textiles**

A Close-Up Look at Textiles

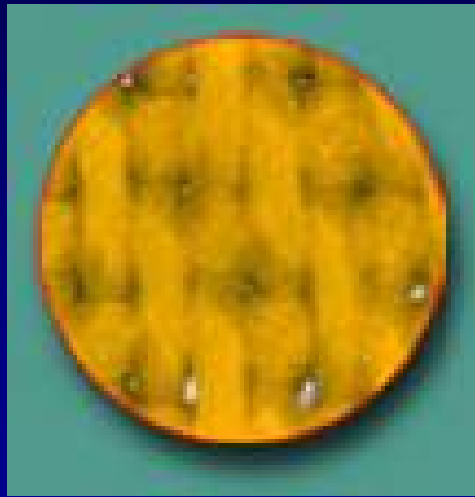
18x Magnification: Micron Openings in Fabric

ProTech



**Range 10-50 microns
Consistent over 100+
lauderings**

Poly/Cotton



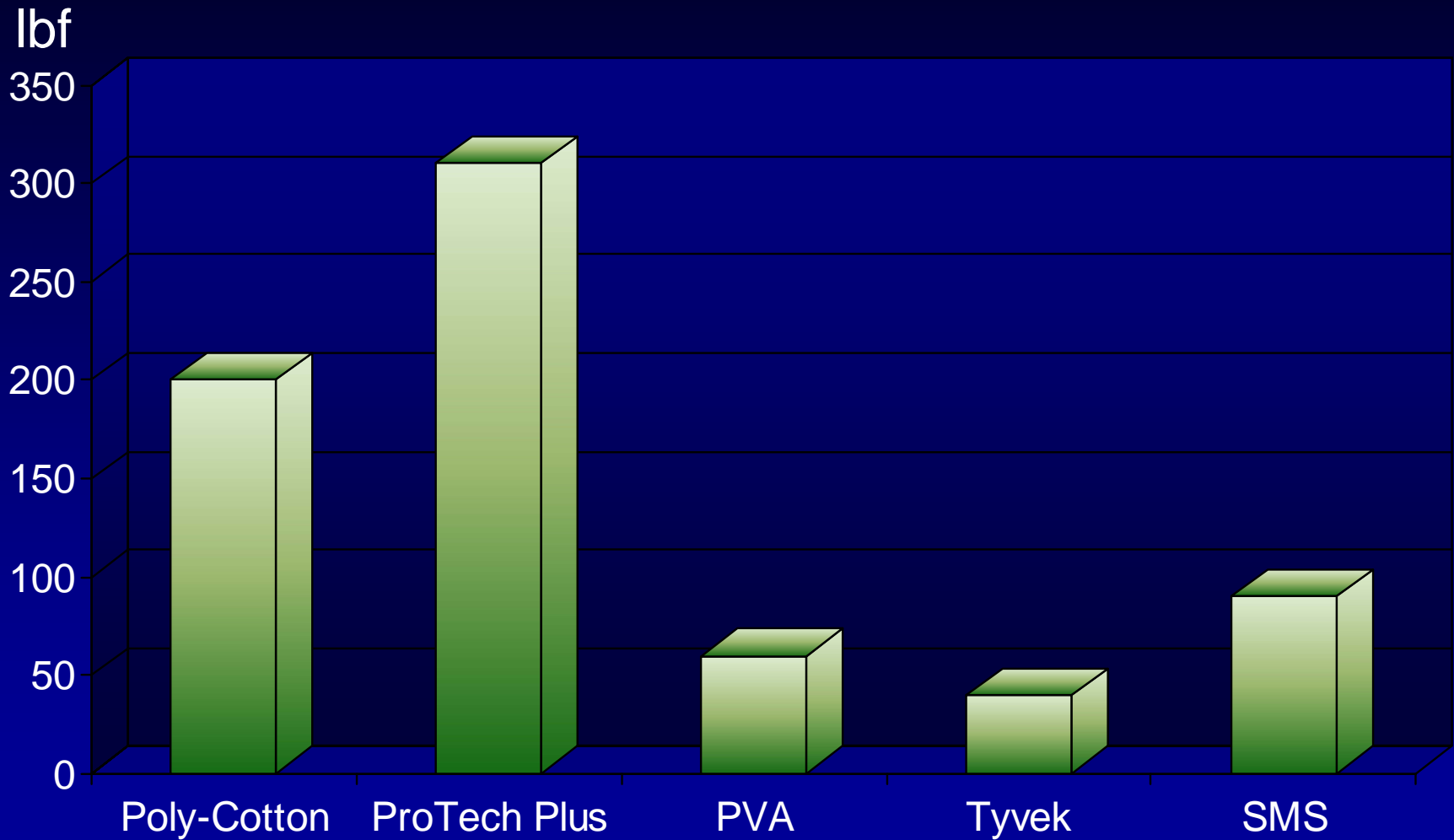
**Range 20-200 microns
Depending on age and
of launderings**

Single Use



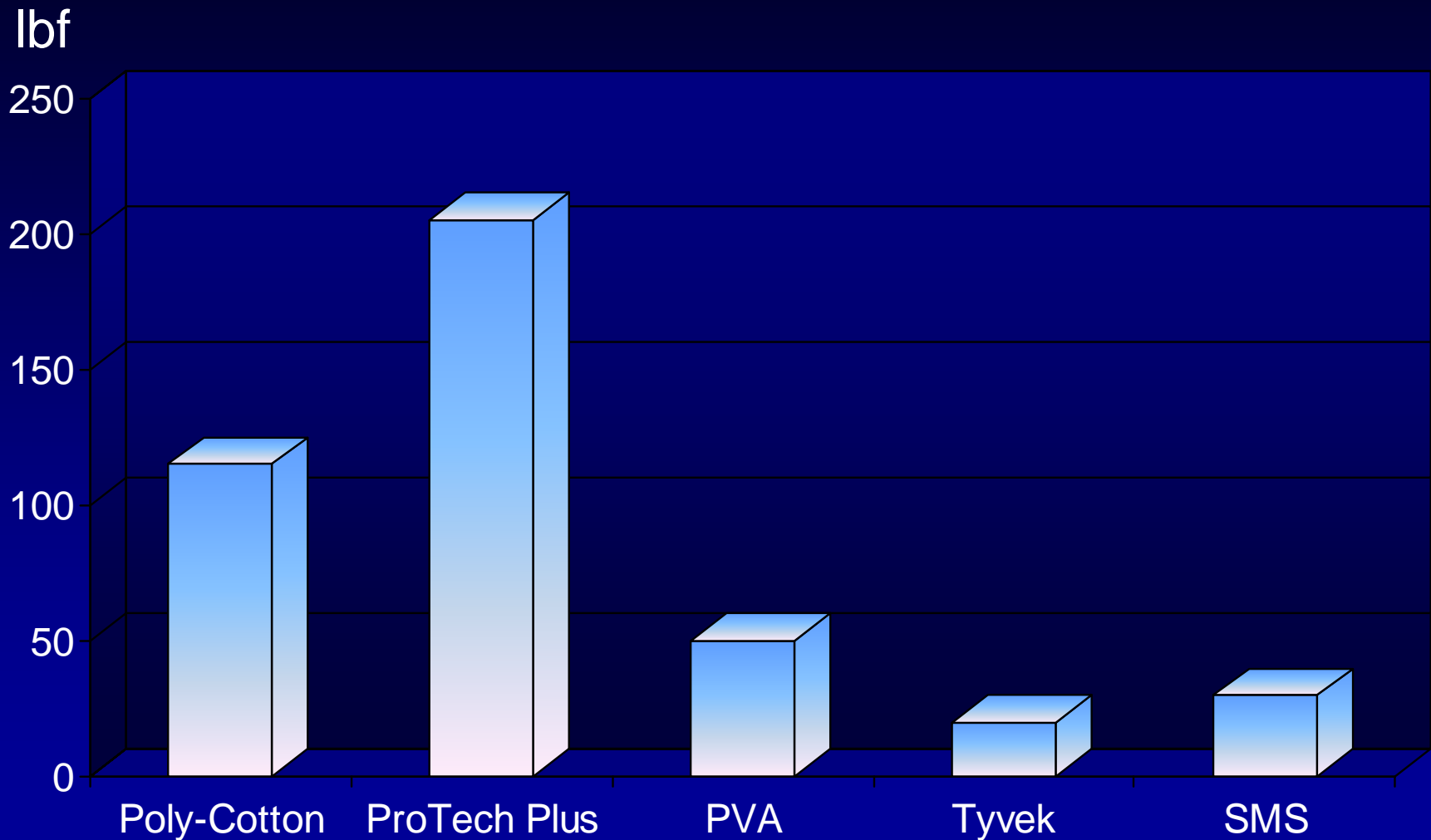
**Range 28-300
microns**

Fabric Bursting Strength ASTM D 3786-01



Resistance of textile fabrics to bursting using the hydraulic diaphragm bursting tester

Fabric Breaking Strength ASTM D 5034-95



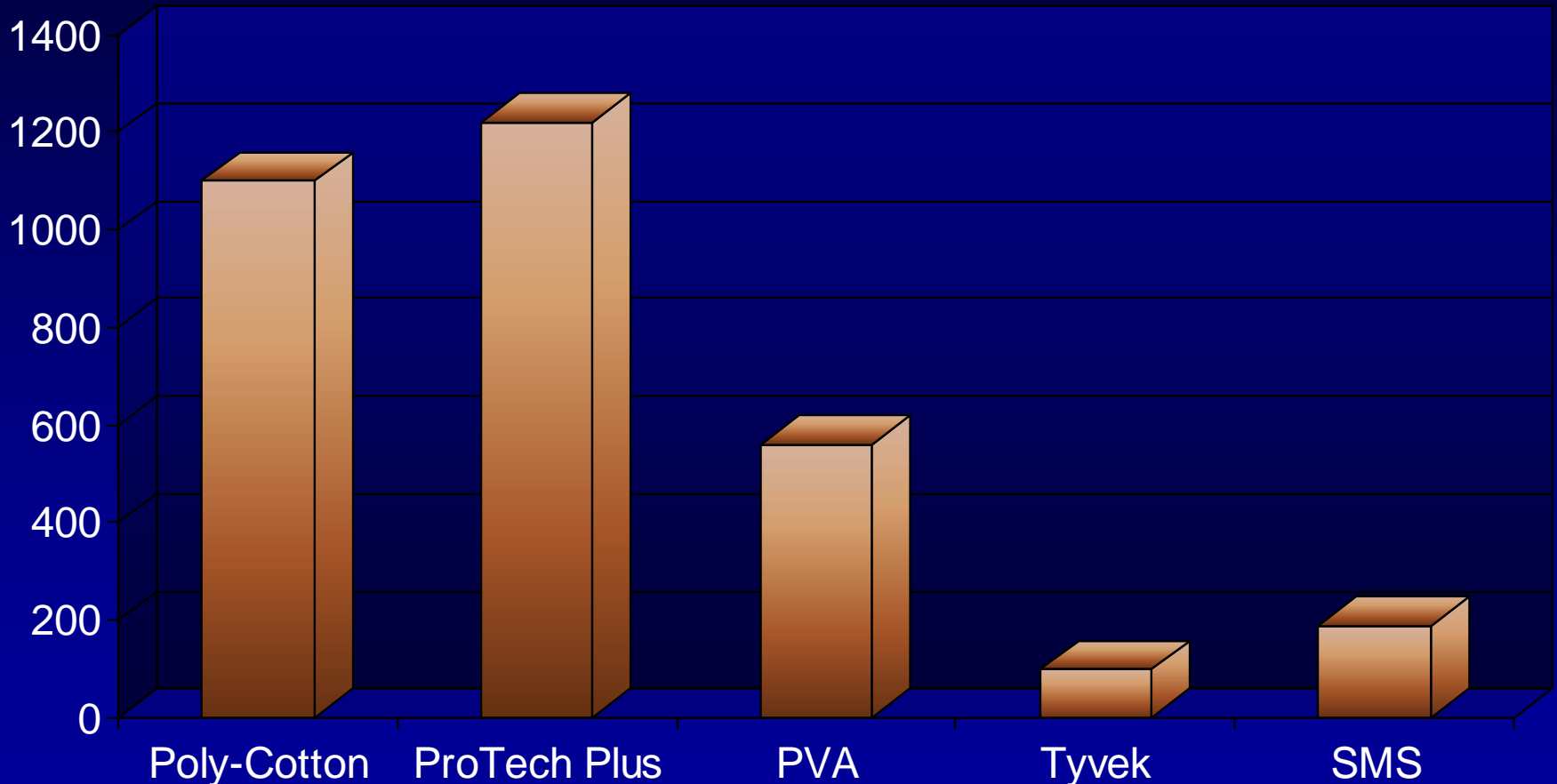
Test for determining the breaking strength and elongation of most textile fabrics

Garment Surface Abrasion

ASTM D 3884-92

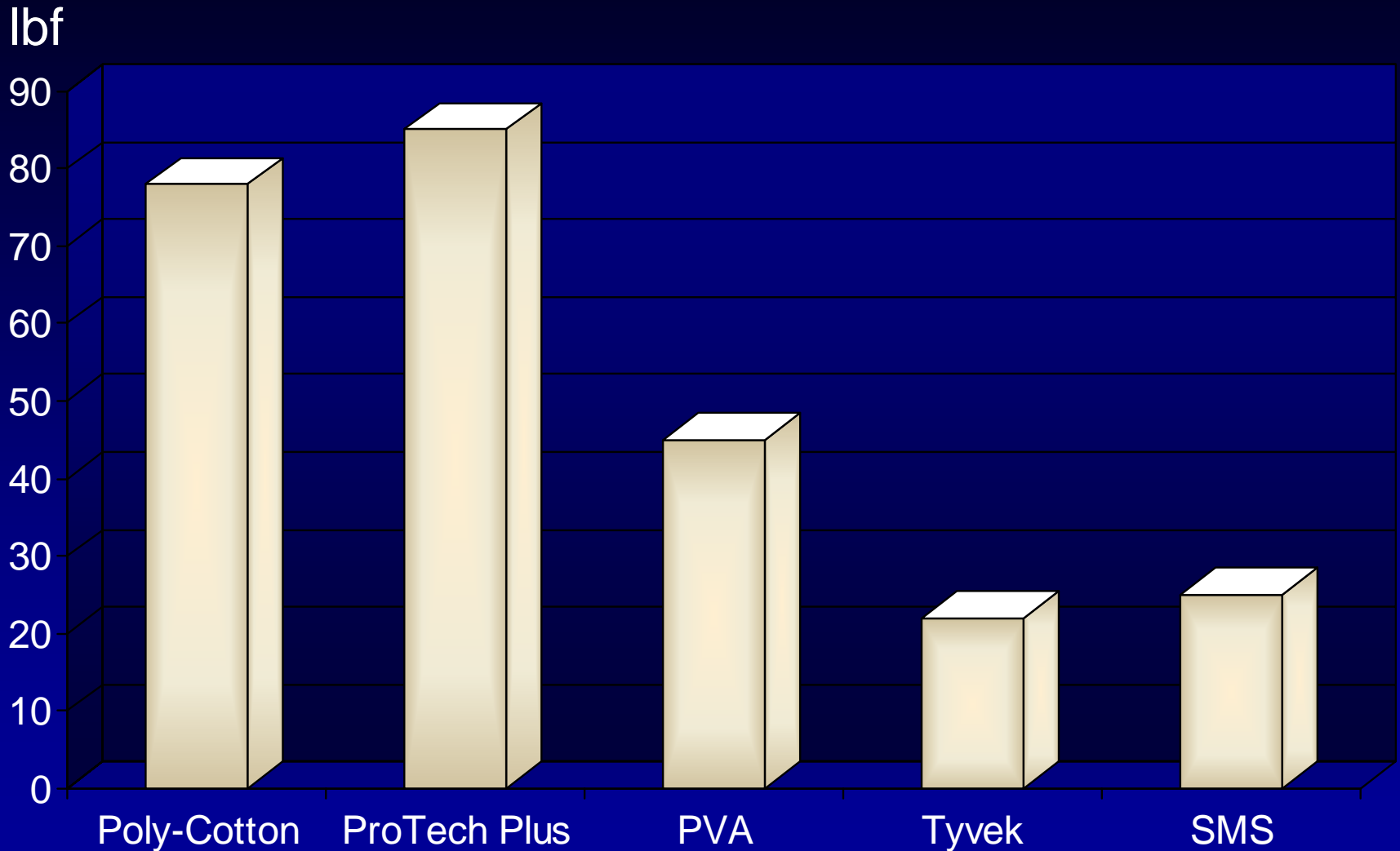
(Taber CS-10 Wheels)

of Cycles
Passed



Abrasion resistance of textile fabrics using rotary platform, double-head tester (RPDH)

Garment Seam Strength ASTM D 1683-90a



Measurement of the maximum sewn seam strength when a force is applied perpendicular to the seam

COMFORT

- Superior Tactile Properties (i.e. feels good)
- Minimal ergonomic encumbrance
- Transmits heat and vapor
 - Adjusted Clothing factors

EPRI Report TR-109445
Heat Stress Management
Program For Power Plants

EPRI Report 1002822
Guidelines For The
Optimization Of Protective
Clothing

COMFORT

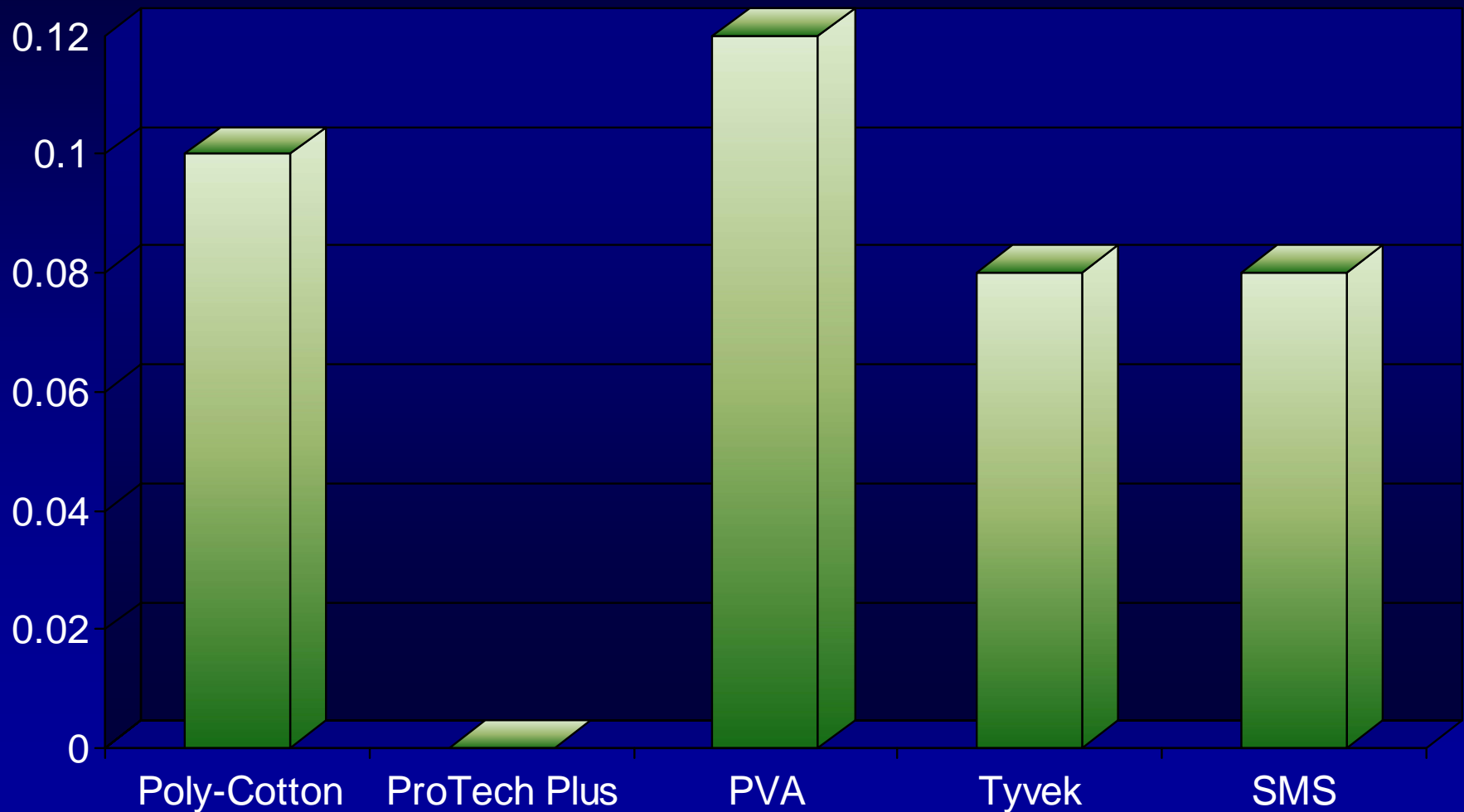
- Kawabata tests
 - Elasticity
 - Tactile
 - Surface roughness/smoothness
 - Stiffness/suppleness
- ASTM D737-96 – Air Permeability of Textile Fabrics
- ISO 11092 – “Skin Model” Test – Sweating Hot Plate (or ASTM 1868)

Fabric Comfort

Insulative Resistance (ISO 11092)

(lower numbers indicate better comfort)

CLO (R-et)

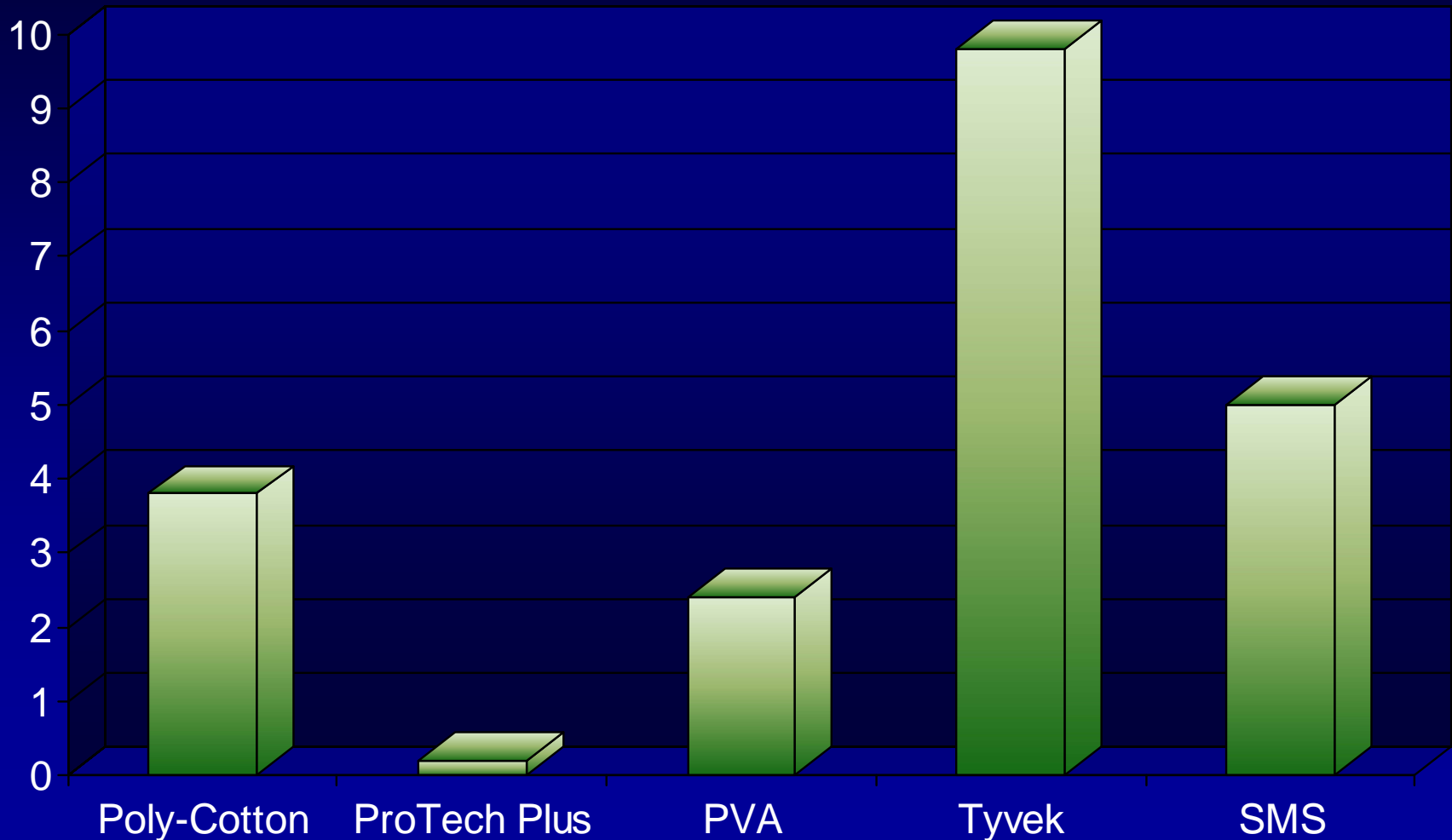


Fabric Comfort

Vapor Transport Resistance (ISO 11092)

(lower numbers indicate better comfort)

R-et (m²*Pa/W)

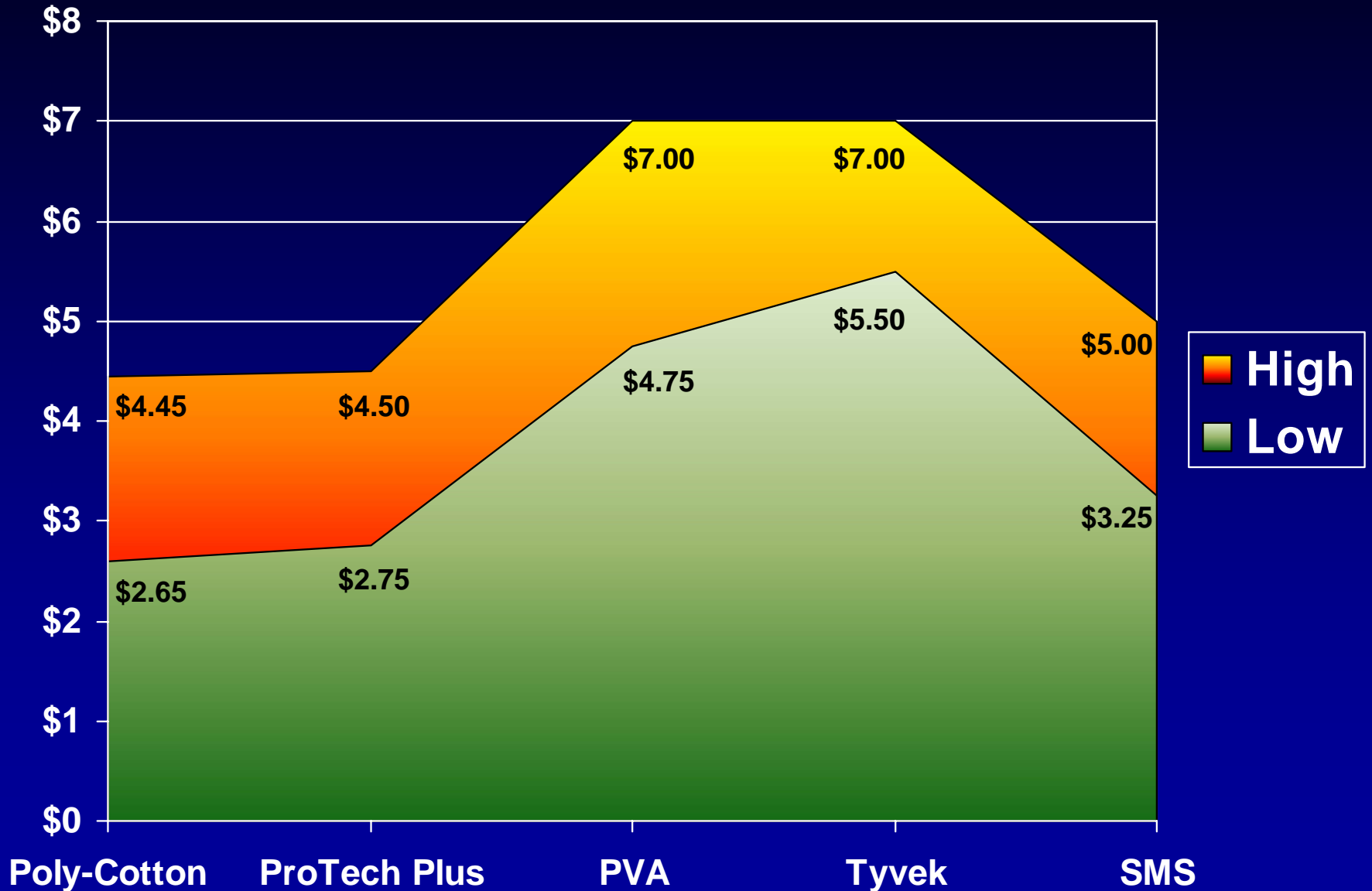


COST

Typical Expenditures For a Garment

- Cost of Garment
- Stocking/Stores Cost
- Distribution
- Processing Cost
- Rip-Out Inefficiencies
- Rad Waste Cost
- Stranded Inventory
- Shipping Labor

Cost Per Use



OVERVIEW

- PPE program can be optimized utilizing launderable as the primary and single-use garments as a sacrificial outer in high contamination areas.
- New technologies in launderable PPE enhance clothing programs:
 - New textiles (ProTech Plus) offer worker comfort and superior protection while minimizing heat stress.
 - Specialized decon formulas combined with reduced monitoring limits (10,000 dpm or less) result in minimized rejects and maximized protection.
 - Provides the lowest cost-per-use while maximizing worker protection.