A Functional and Economic Comparison of Films and Tapes designed for Aircraft Thermal and Acoustic Insulation Systems

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Far 25.856(a)

- “…thermal/acoustic insulation material installed in the fuselage of transport category airplanes to pass a flame propagation test. The test involves exposing samples of thermal/acoustic insulation to a radiant heat source and a propane burner for 15 seconds.

Far 25.856(a)

- The tested insulation must not propagate flame more than 2 inches away from the burner. The flame time after removal of the burner must not exceed 3 seconds on any specimen." (Federal Register/Vol. 68, No. 147, pg. 45047)

Far 25.856(a)

- Weight Penalty
- Increased Operating Costs

Range of Weights
PET & PVF Covering Films

PET Covering Films

0.5 oz/yd^2 (17 g/m^2)

to

1.4 oz/yd^2 (47.6 g/m^2)

TYPICALLY

0.5 to 0.9 oz/yd^2 (17 to 30.6 g/m^2)

PVF Covering Films

1.0 oz/yd^2 (34.0 g/m^2)

to

1.4 oz/yd^2 (47.6 g/m^2)

TYPICALLY

1.0 to 1.4 oz/yd^2 (34 to 47.6 g/m^2)

Light Weight Film Extrusion

Courtesy of

Victrex

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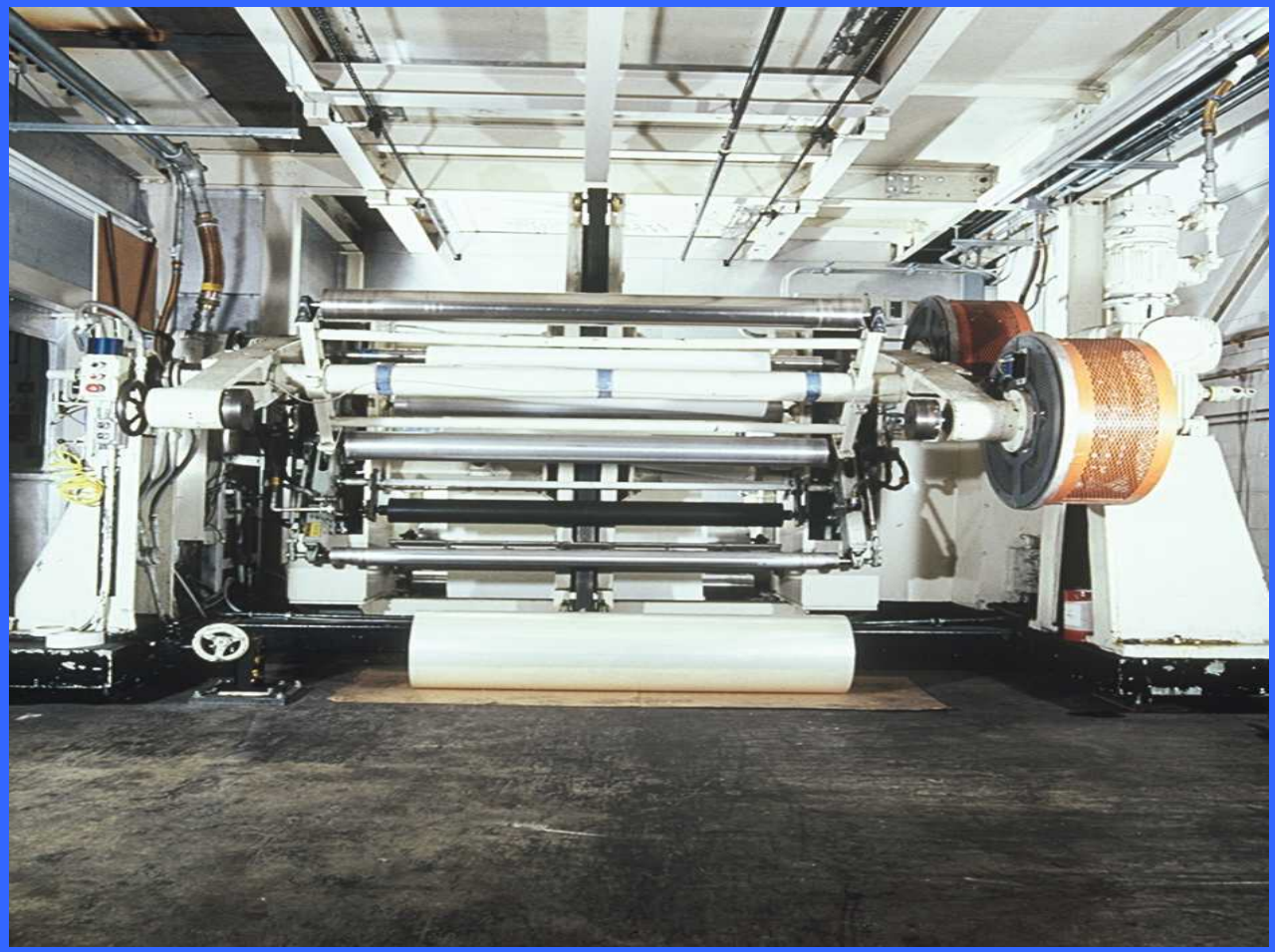
Covering Film Manufacturing



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Range of Weights for PET, PVF & PEKK/PEEK Covering Films

PET	PVF	PEKK/PEEK
0.5 oz/yd^2 (17 g/m^2)	1.0 oz/yd^2 (34 g/m^2)	0.67 oz/yd^2 (22.8 g/m^2)
to	to	to
1.4 oz/yd^2 (47.6 g/m^2)	1.4 oz/yd^2 (47.6 g/m^2)	0.75 oz/yd^2 (25.5 g/m^2)

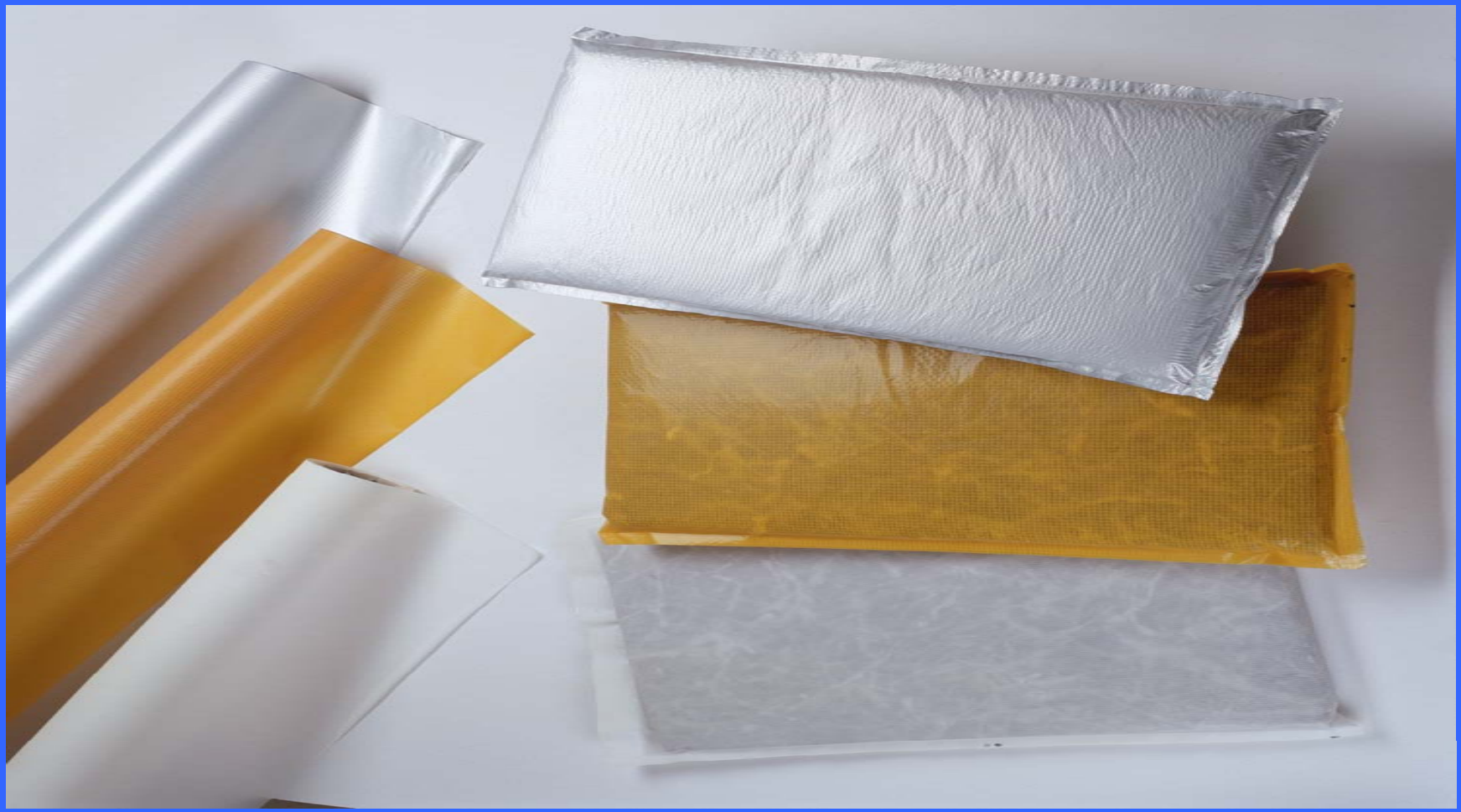
Weight Savings/Aircraft Type

- 70# (32 kg) – Single Aisle Aircraft
- 200# (91 kg) – Wide Body Aircraft

Physical Comparisons

Physical Char.	PVF		PEKK/PEEK	
	Ex. 1	Ex 2	Ex. 1	Ex. 2
Thickness (mil) (microns)	.50 12.7	.50 12.7	.25 6.3	.25 6.3
Weight (oz/yd^2) (g/m^2)	1.4 47.6	1.0 34.0	0.75 25.5	0.67 22.8
Puncture (#) (N)	18 80	13 56	9 40	7 29
Burst (PSI) (KN/m^2)	73 506	57 390	46 320	30 208

Evaluation of Blanket Fabrication



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Evaluation of Blanket Fabrication

- Pin holes

Evaluation of Blanket Fabrication

- Pin holes
- Manual cutting process

Evaluation of Blanket Fabrication

- Pin holes
- Manual cutting process
- Process adjustments = No loss in manufacturing efficiencies

Evaluation of Heat Sealing

- Impulse Heat Sealing
  - Seals faster
  - Lower energy settings
- Ultrasonic Heat Sealing
  - Limited experience
  - No problems reported

Evaluation of Blanket Fabrication

- Some processes have to be optimized
- No sacrifice to production efficiencies

Evaluation of Blanket Installation

Courtesy of MTI

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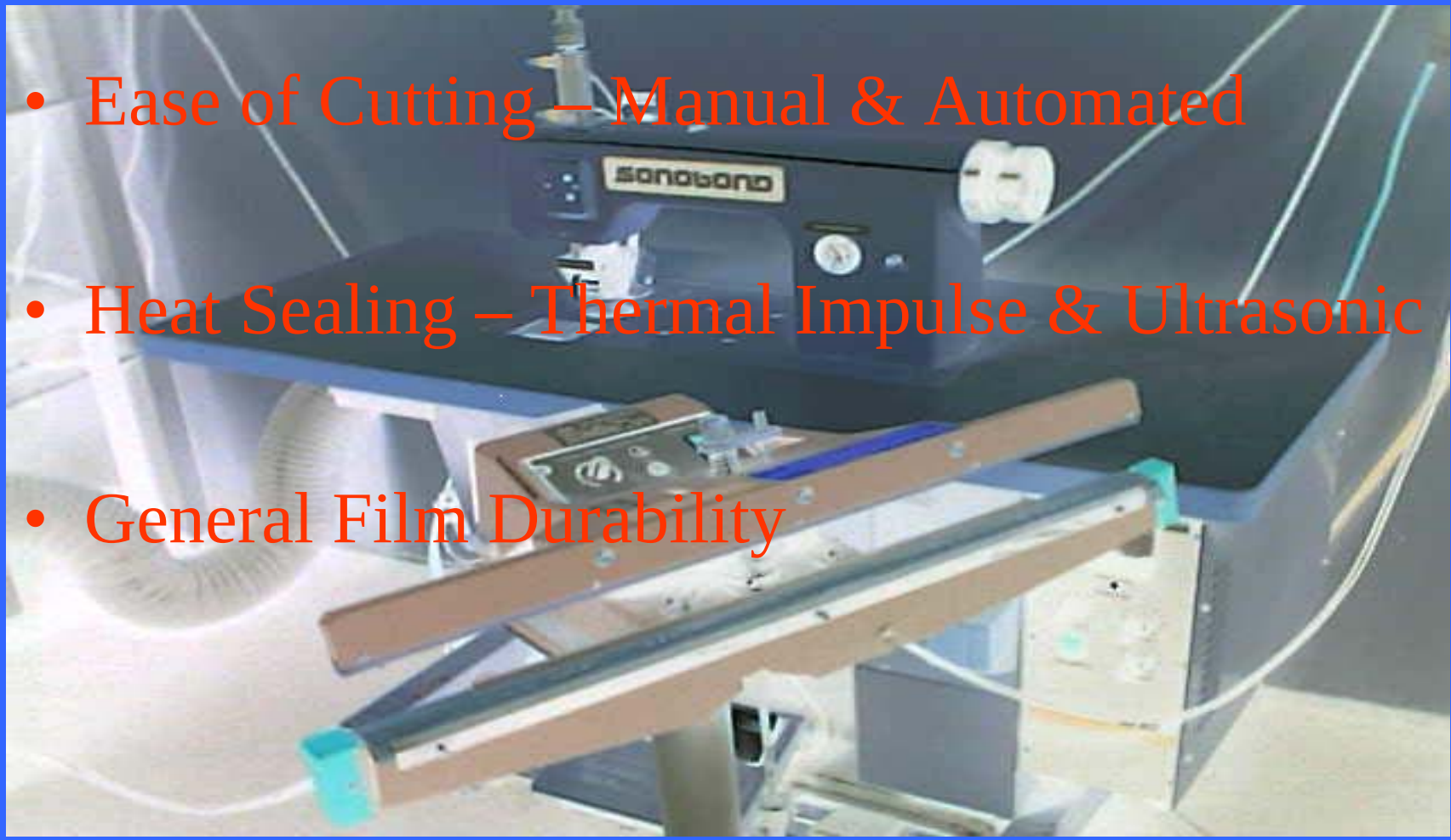
Blanket Fabrication Summary



- Ease of Cutting – Manual & Automated
- Heat Sealing – Thermal Impulse & Ultrasonic
- General Film Durability

Blanket Installation Summary

- General Durability

Courtesy of MTI

Far 25.856(b)

- “…insulation materials installed in the lower half lf the airplane to pass a test of resistance to flame penetration. The test involves exposing samples of thermal/acoustic insulation blankets mounted in a test frame to a burner for four minutes.

Far 25.856(b)

- The insulation blankets must prevent flame penetration for at least four minutes and must limit the amount of heat that passes through the blanket during the test.”

  (Federal Register/Vol. 68, No. 147, pg. 45047)

Far 25.856(b)

- Burn through rule involves about 40% of the fuselage (lower lobe)
- September 2, 2009 compliance date

Lighter Weight PS Tapes

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Conclusion

- Favorable reports after almost 3 years of experience
  - Fabrication
  - Installation

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