



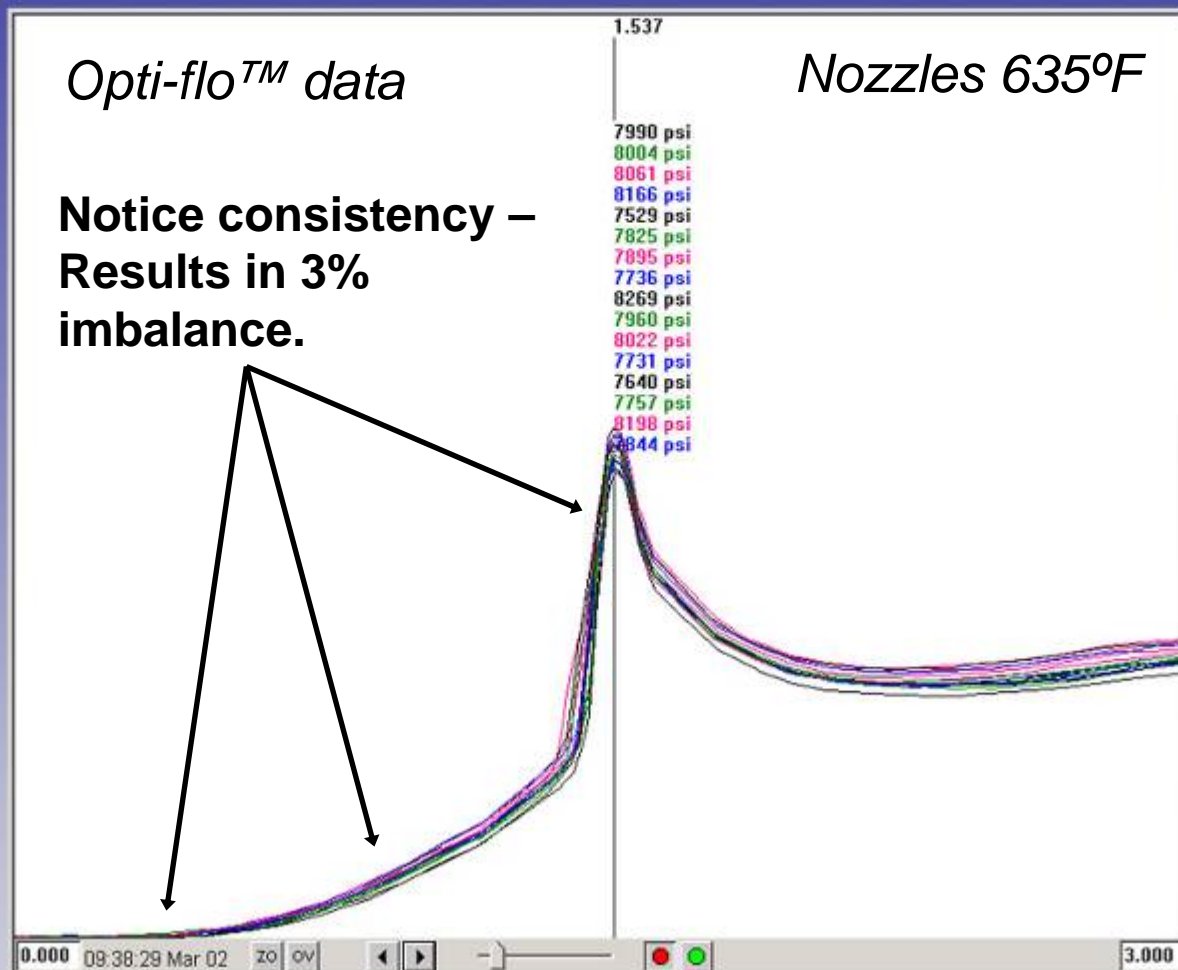
Molding Study

16 Cavity Hot Runner Mold

Full Shot Pressure Data

Material: PA66

(Utilizing Opti-flo™ Technology)





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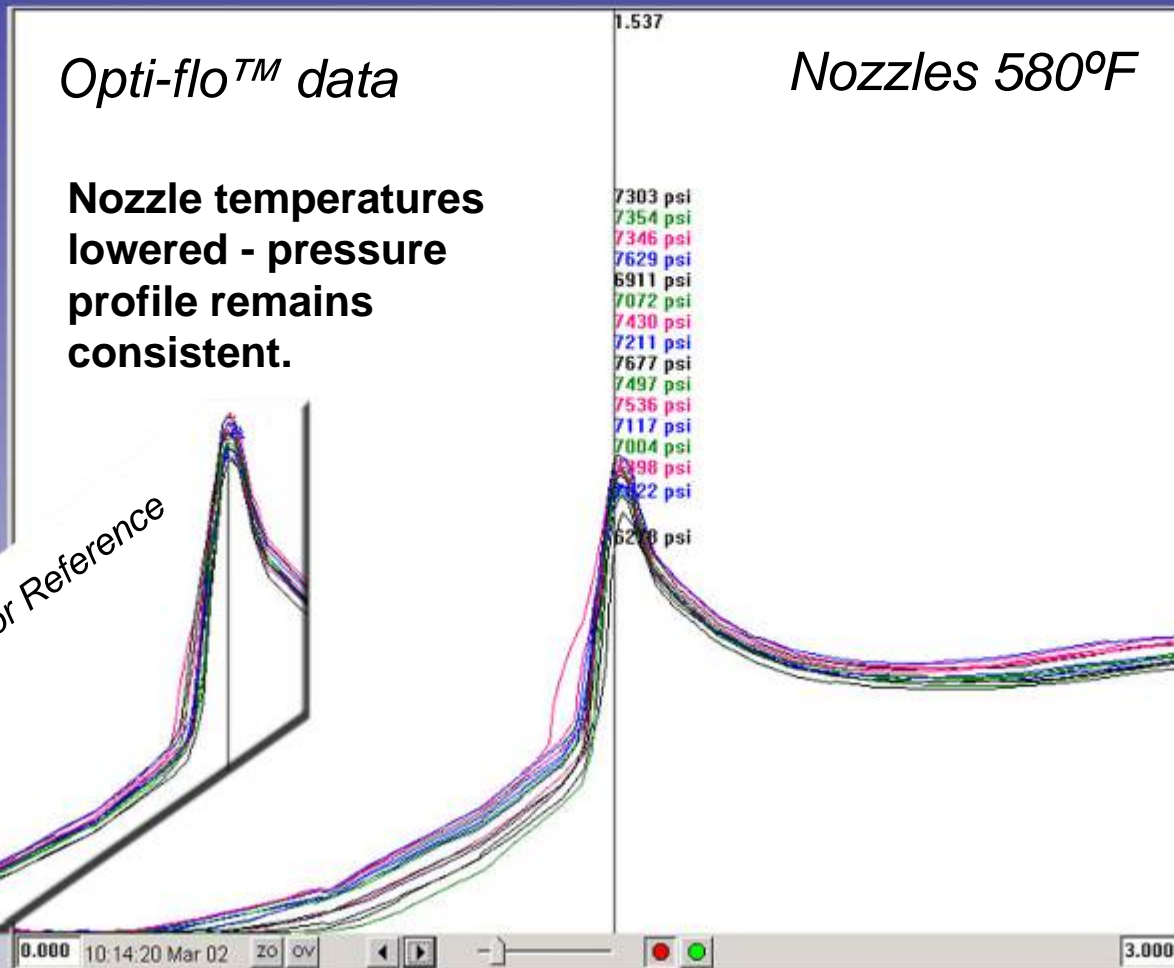
(Utilizing Opti-flo™ Technology)

Opti-flo™ data

Nozzle temperatures lowered - pressure profile remains consistent.

Nozzles 580°F

Nozzles 635°F for Reference





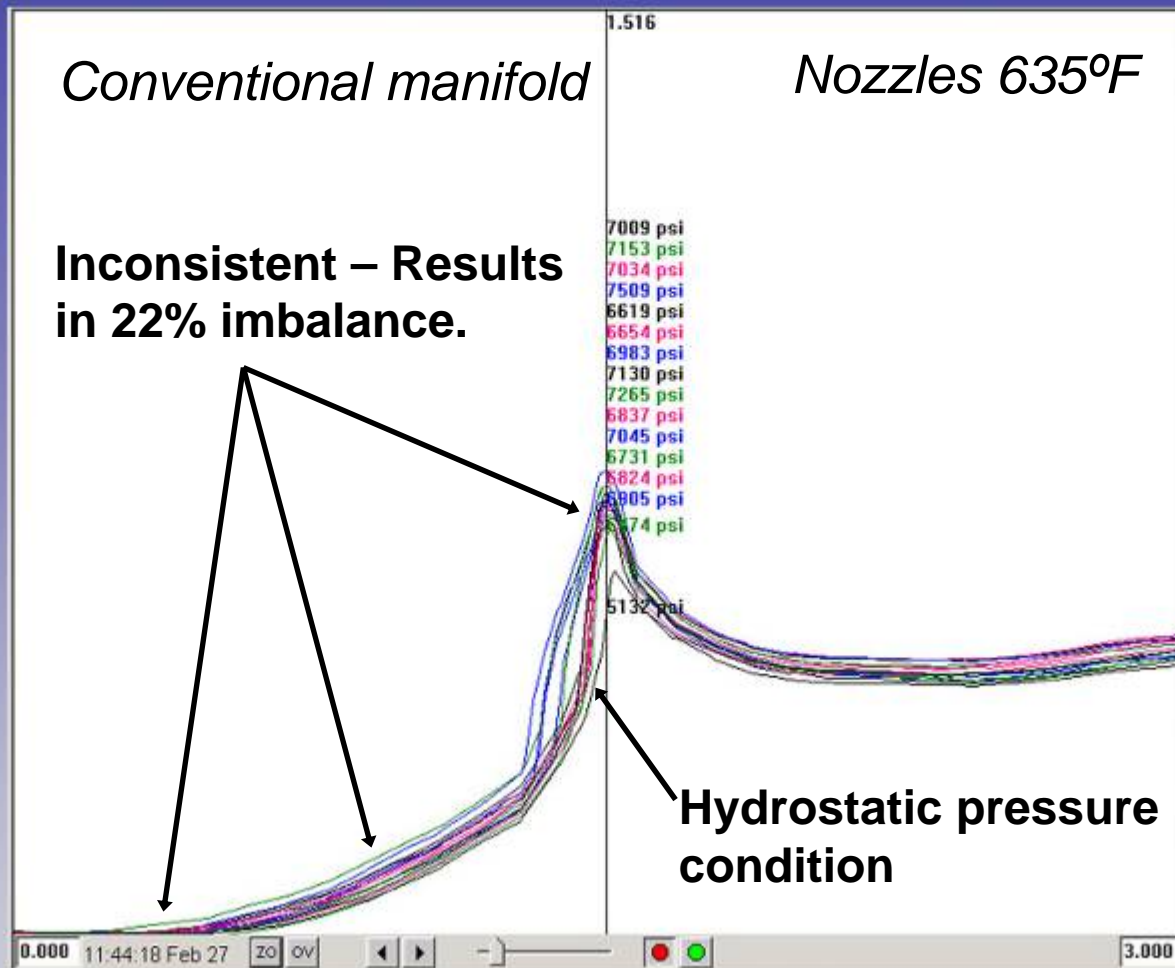
Molding Study

16 Cavity Hot Runner Mold

Full Shot Pressure Data

Material: PA66

(with conventional manifold design)





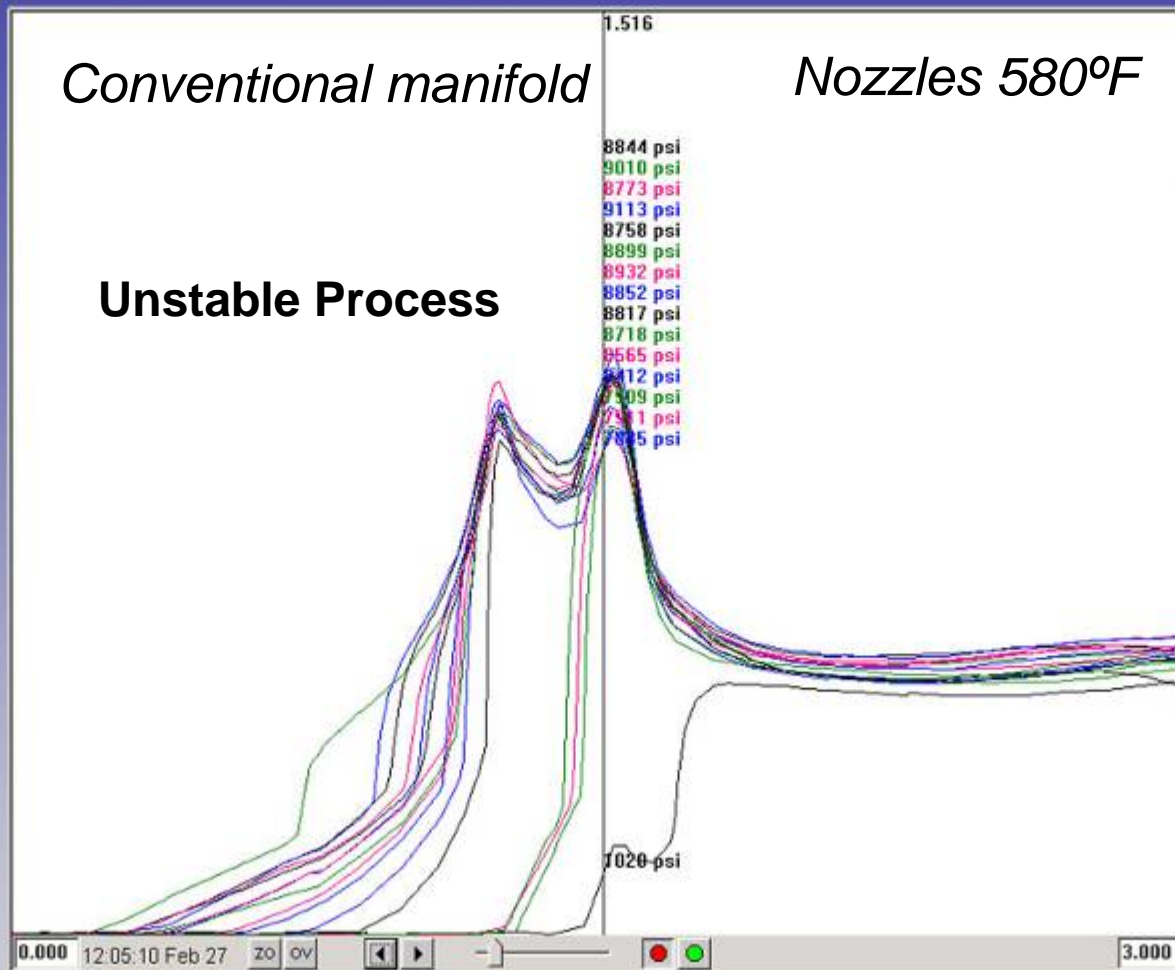
Molding Study

16 Cavity Hot Runner Mold

Full Shot Pressure Data

Material: PA66

(with conventional manifold design)



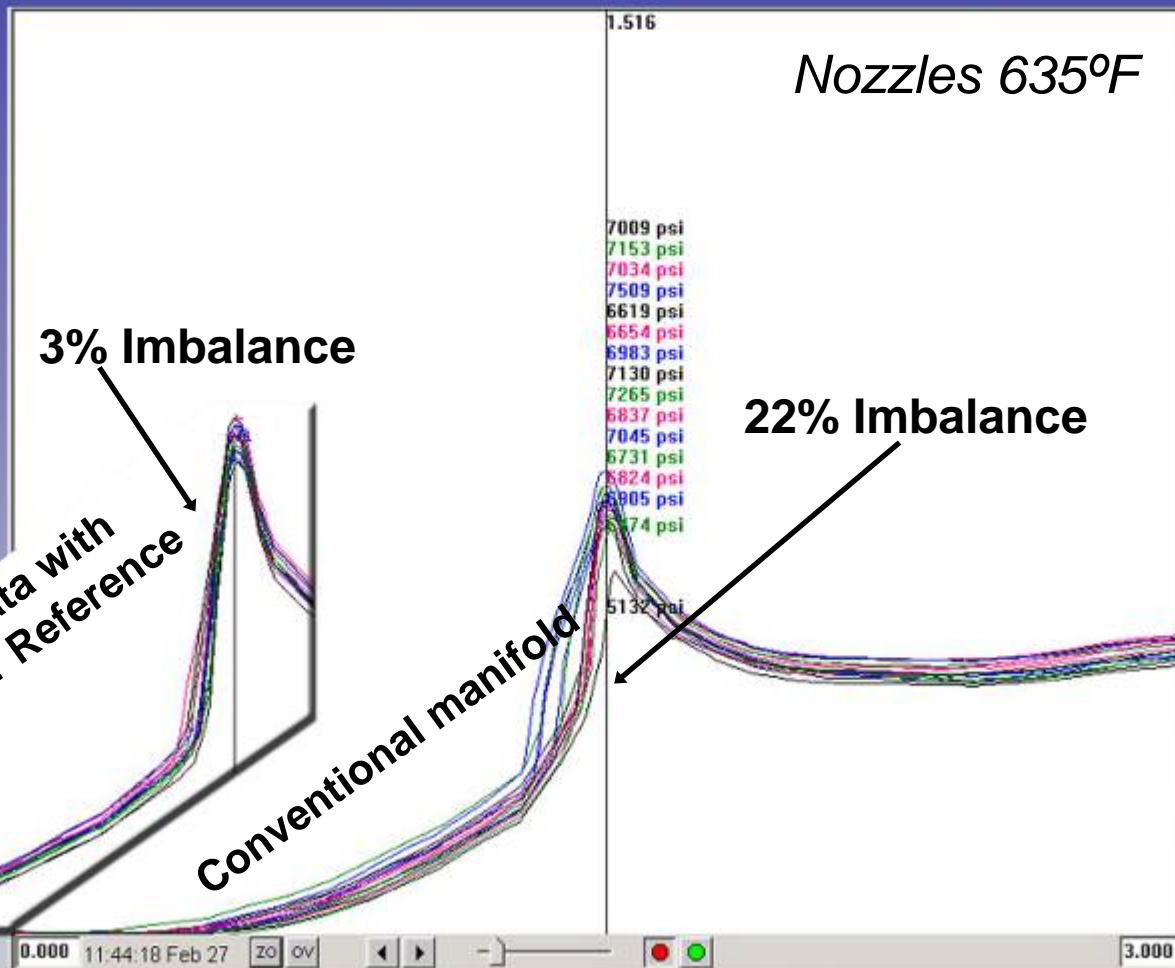


Molding Study

16 Cavity Hot Runner Mold

Full Shot Pressure Data

Material: PA66
(comparison)





Molding Study

16 Cavity Hot Runner Mold

Full Shot Pressure Data

Material: PA66

(with conventional manifold design)

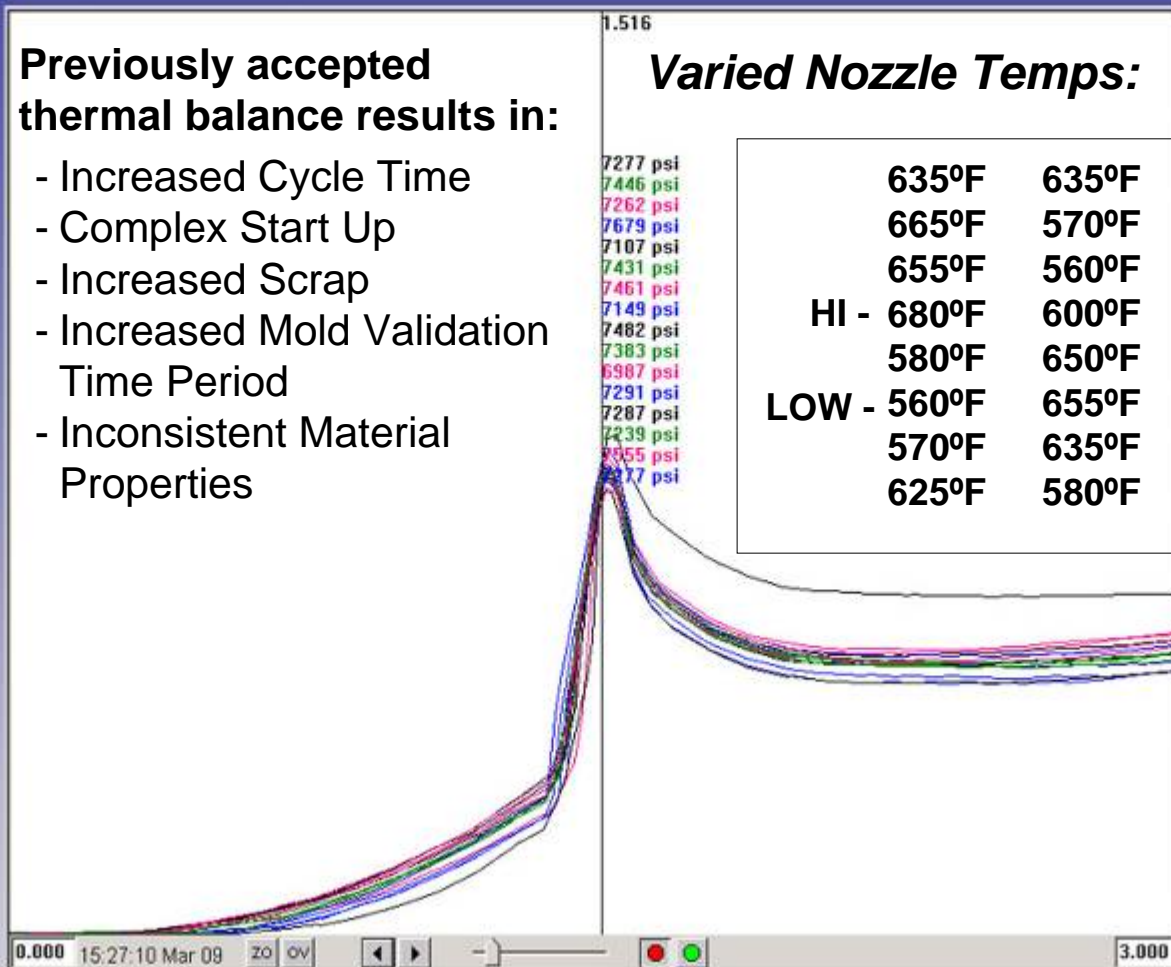
Previously accepted thermal balance results in:

- Increased Cycle Time
- Complex Start Up
- Increased Scrap
- Increased Mold Validation Time Period
- Inconsistent Material Properties

Varied Nozzle Temps:

	635°F	635°F
	665°F	570°F
	655°F	560°F
HI -	680°F	600°F
	580°F	650°F
LOW -	560°F	655°F
	570°F	635°F
	625°F	580°F

Delta = 120°F



580°F (Opti-flo) Vs. 680°F (Conventional) = Faster Cycle Time w/ Opti-flo™!!





Mold Study with and without Opti-flo™ Hot Runner Technology

16 Cavity Cup Mold
Materials: ABS; PMMA; PS; PE

Without Opti-flo™

- Shear induced filling imbalance from +10 to +22%
- Impact modified PMMA was most sensitive (over 20%). PE was least sensitive (10%)
- % Filling imbalance significant, cavity filling & pack pressure variations (2,000 psi+ common)
- Imbalance can not be geometrically corrected (significant hot drop and melt temperature variations would be required to attempt a filling balance)

With Opti-flo™

- Shear induced filling imbalance reduced to -1 to -4%
- All materials had similar balance characteristics (Opti-flo™ design is less sensitive to material and process variations)
- Cavity filling & pack pressure variations significantly reduced
- Optimized balance simplifies processing





Opti-flo™

Return on Investment

Savings evaluated by tangibles:

- Scrap reduction
- Efficiency increase
- Cycle time reduction
- Reduced setup / downtime
- Lower clamp tonnage / press size
- Lower injection pressures / energy consumption
- Lower tool maintenance cost
- Increased cavitation

Savings evaluated by intangibles:

- Simplified processing requirements
- Improved part quality to customers
- Faster part qualification process





Benefits of Opti-flo™ Hot Runner Technology

Part Quality

- Uniform part weights
- Uniform part dimensions
- Uniform mechanical properties
- Reduced warp
- Reduced flash, short shots, scrap, etc...

Process Improvement

- Minimized flow front velocity differences
- Reduced cycle time
- Lower injection pressures
- Lower clamp tonnages
- Wider process window

Productivity Benefits

- Increased cavitation for high precision parts
- Reduced scrap rates
- Reduced down time
- Reduced mold maintenance
- Faster mold commissioning





The Opti-flo™ Answer

Opti-flo™

- Inexpensive initial investment
- One-time non-varying implementation
- Consistent without recalibration
- Impervious to processing changes
- No maintenance or added costs