

MANUFACTURING AND OPERATIONS

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AGENDA

- **MANUFACTURING AND OPERATIONS OVERVIEW**
- **JAMES HARDIE MANUFACTURING ADVANTAGE**
- **JAMES HARDIE MANUFACTURING APPROACH**
- **APPROACH TO NEW LINE COMMISSIONING**

OPERATIONS STRATEGY

- Provides a safe environment and good workplace for all employees, and complies with environmental regulations
- Enables JH's Product Leadership of making highest quality fiber cement
- Ensures capacity is available during periods of peak demand
- Allows delivered unit cash costs to remain relatively flat during periods of lower utilization

MANUFACTURING PROCESSES

Process technology segments manufacturing approach

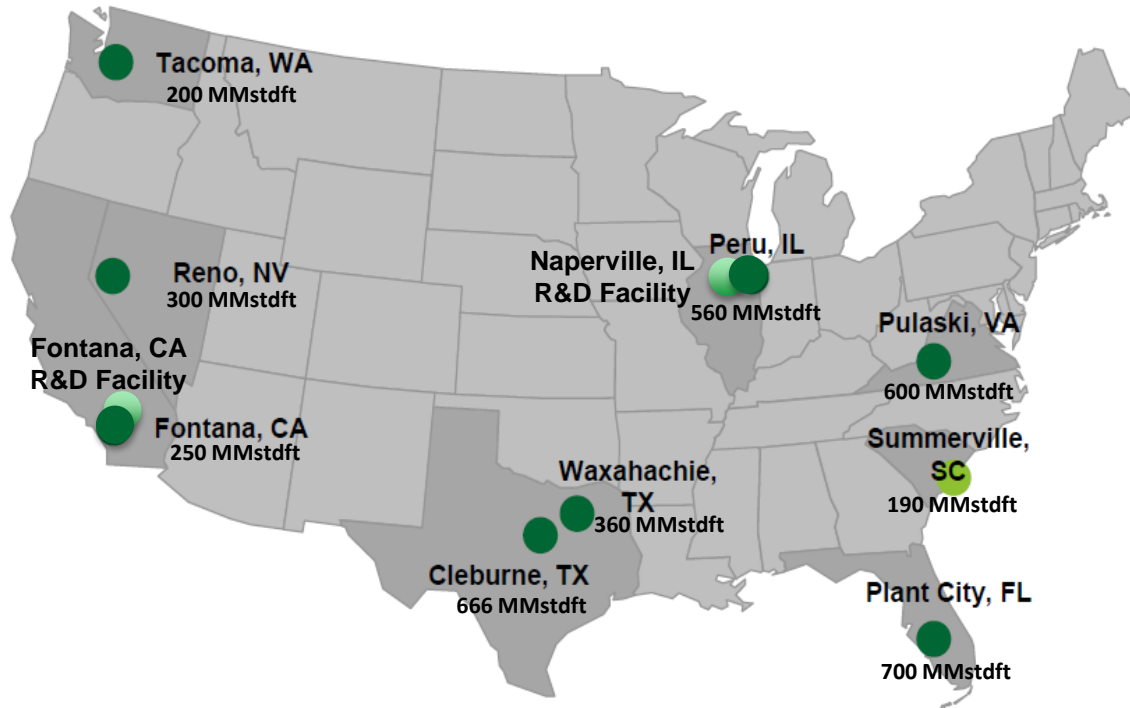
	<u>Pre-Autoclave</u>	<u>Post-Autoclave</u>
Manufacturing Process	Continuous Process Raw Material Conversion	Material handling Coatings application
Key Process Objectives	Long Continuous runs Raw material yield	Optimize coating yield
Inventory Model	Make-to-Inventory	Mix of Make-to-Inventory and Make-to-Order

James Hardie's Management System

Operators operate, managers manage and engineers support / enable

NORTH AMERICA FOOTPRINT & PERFORMANCE

USA Plant Locations



- Largest fiber cement producer in North America
- 1,505 manufacturing employees
- 9 manufacturing locations*
- 2 research and development facilities

**Production was suspended at the Summerville plant in November 2008*

WHAT IS OPERATIONS ORGANIZATION ?

Manufacturing

Safety in every part of our process. Delivering on our brand promise while optimizing returns

Safety

Quality

Plant Leadership

Reliability & Plant Performance

Manufacturing Cost Optimization

Supply Chain

Total value chain (raw materials to customer) optimization while creating non-product value add

Customer Integration

Network Planning

Transportation

Procurement

Capacity Management

Engineering

Maximizing capacity, innovating new products and processes, and ensuring sustainability.

New Capacity Design

35/90 Network Design

Platform Development

Step-Change Processes

Reliability & Pci/PdI

Finance & Human Resources

Helping to maximize resources and provide meaningful analytics and guidance to the business.

ROCE Optimization

Cost Performance

Step-Change IT Capabilities

Hourly Workforce Development

Operations Leadership Development



JAMES HARDIE'S MANUFACTURING ADVANTAGE

MANUFACTURING ADVANTAGE

JH manufacturing: Major lever in our competitive advantage

Proprietary technology delivers unit cost & ROCE advantage

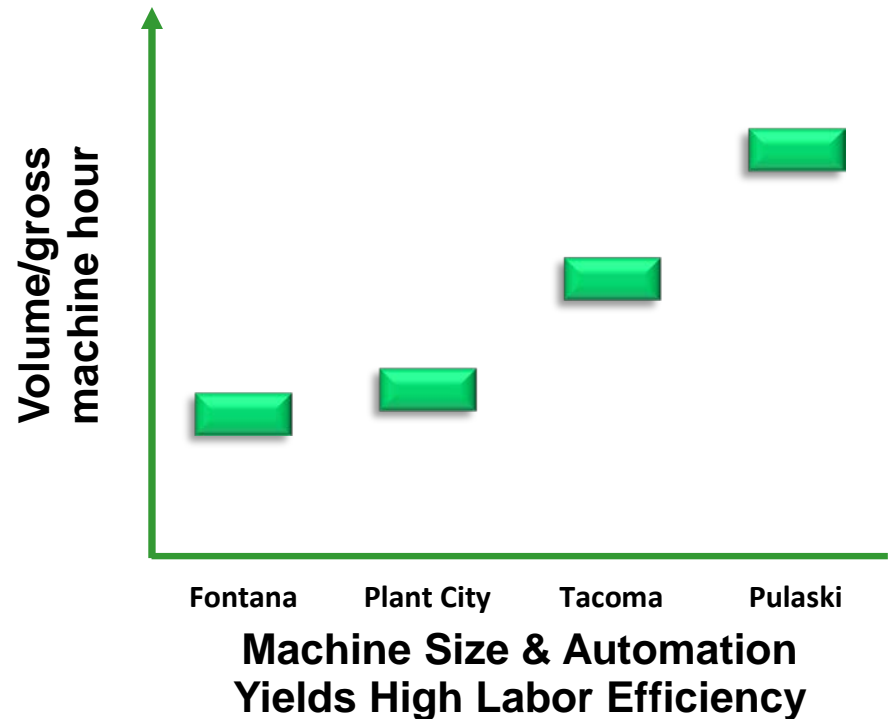
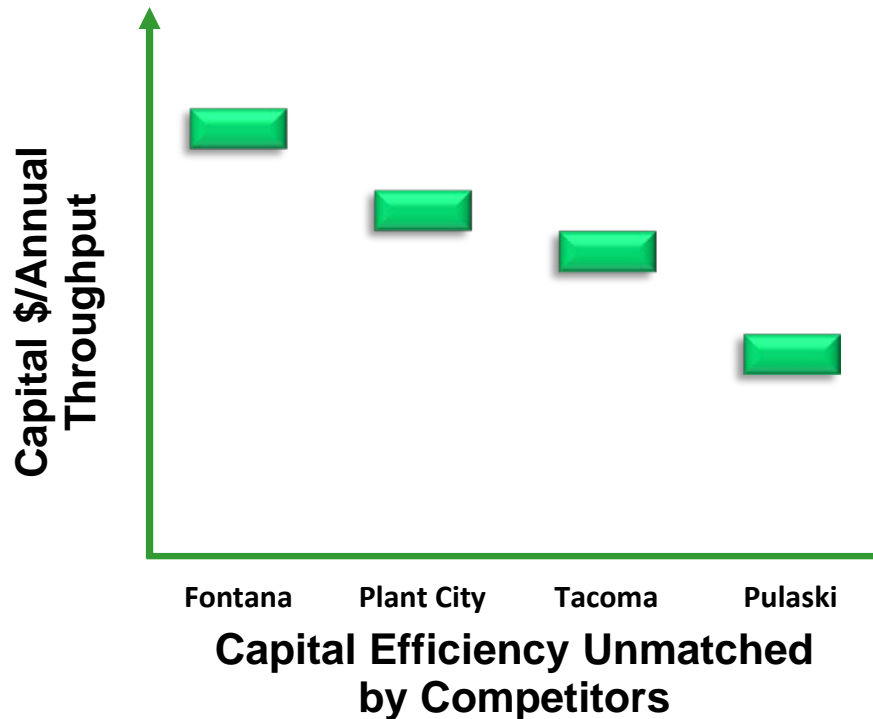
- ➔ Unique throughput advantage in our Hatscheck manufacturing
- ➔ Engineered scale creates labor and capital advantage
- ➔ Flexible manufacturing achieves low unit cost through market cycles

Innovation in process capability enables product leadership

- ➔ Process capability to deliver innovative product differentiation
- ➔ Innovation approach delivers speed to market advantage
- ➔ Network flexibility creates delivered cost advantage

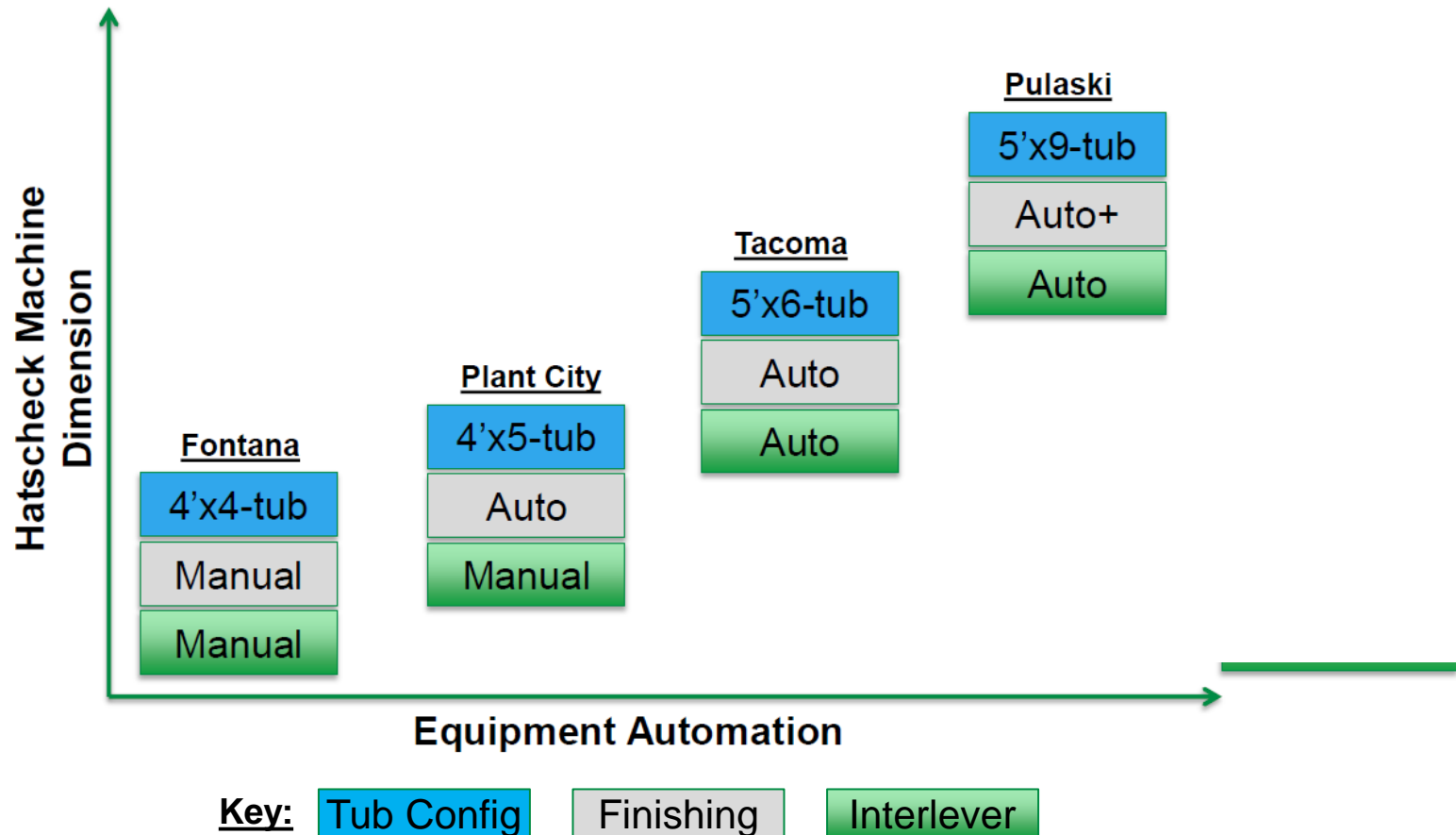
SCALE AS A COMPETITIVE ADVANTAGE

Manufacturing scale creates a significant competitive advantage



MANUFACTURING SCALE EVOLUTION

A culture of engineering step-change has yielded a tremendous increase in manufacturing scale



PROCESS & PRODUCT CAPABILITY ADVANTAGE

Internally developed process capability enables product differentiation

Product thickness & density control



HardieTrim® & Artisan product lines

Fit-to-purpose manufacturing processing



HardieZone® Engineered for Climate

Post-processing engineering



HardieShingle®

Coatings application expertise



ColorPlus® Technology

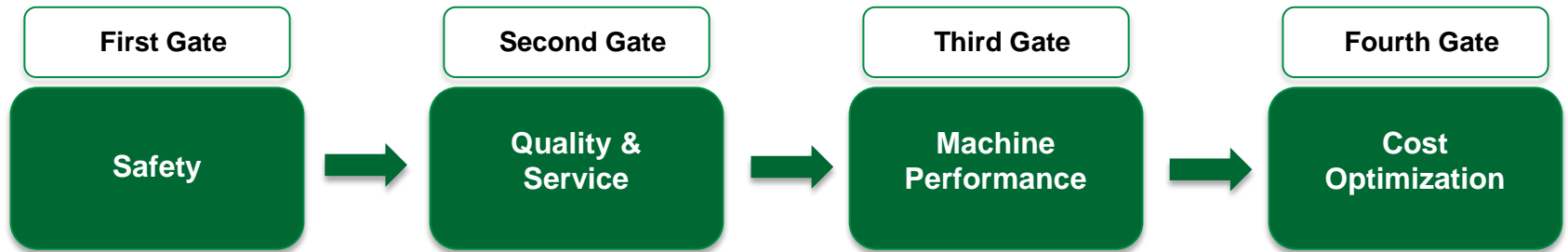
MANUFACTURING ADVANTAGE SUMMARY

- Step change engineering focus has delivered a substantial manufacturing scale advantage
- Constant investment in manufacturing process capabilities enable our product differentiation
- Flexibility in manufacturing and capacity model allow for cost advantage through market cycles



JAMES HARDIE'S MANUFACTURING MANAGEMENT SYSTEM

MANUFACTURING GATES 2017



- Gate requirements still in place from FY16
- Path to achieve a journey ... tasking sites to learn to run as holistic business
- Goal achievement requires understanding of the interrelated nature of metrics

FIRST GATE: SAFETY

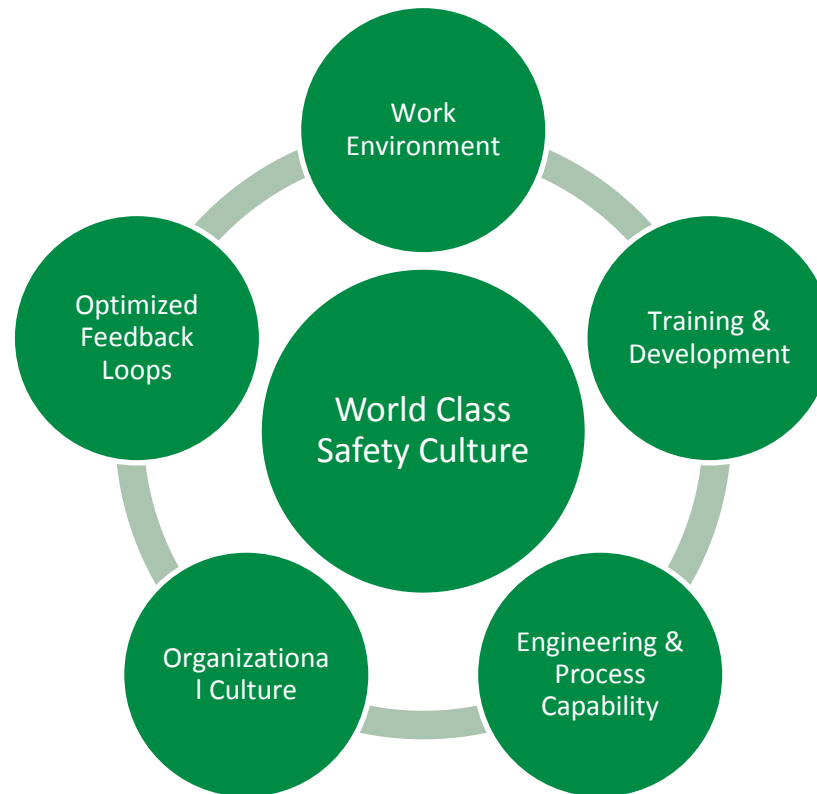
First Gate

Safety

Goal: Zero Harm

Safety remains the #1 priority

- Organization Culture
- Work Environment
- Engineering Capability

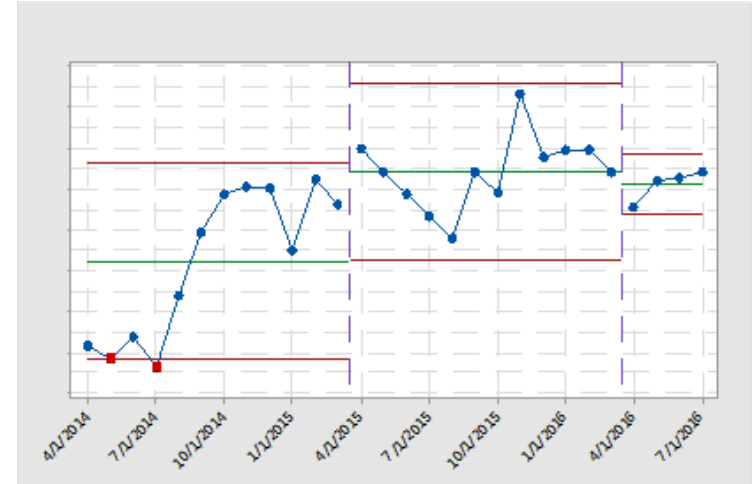
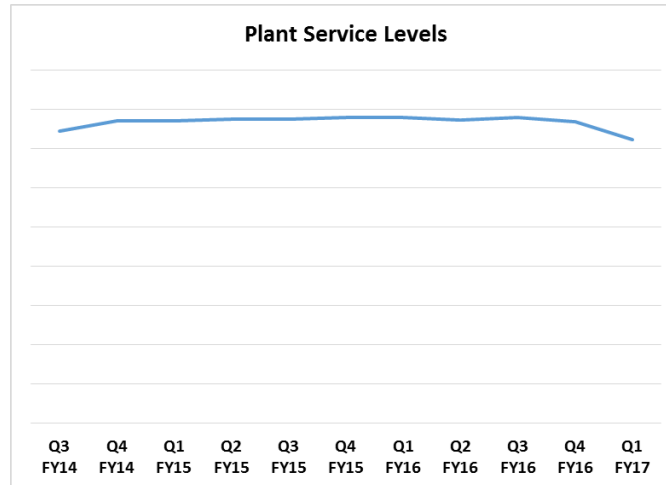


- Training and Development
- Feedback Loop Optimization

SECOND GATE: QUALITY & SERVICE

Second Gate

Quality &
Service

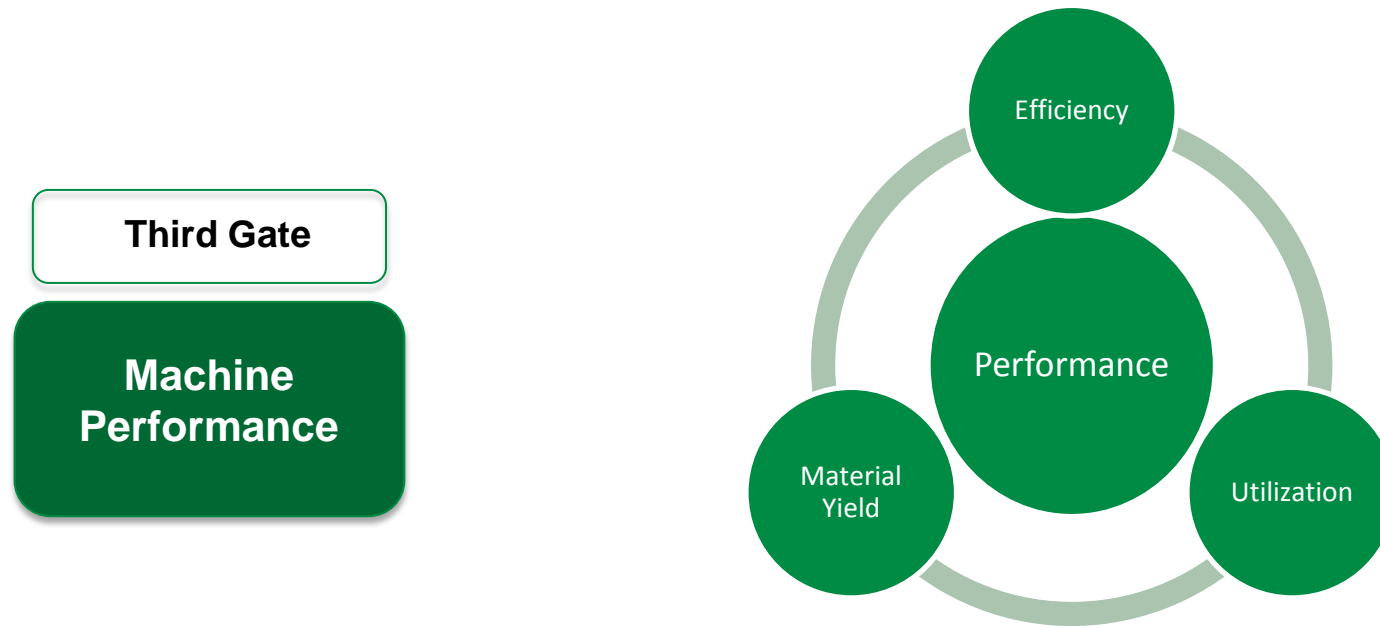


Goal: Deliver on the Brand Promise

Quality in execution

- 100% 1st Pass & 97% Service
- Improve schedule adherence
- Reduce process variation
- Increase process sustainability

THIRD GATE: MACHINE PERFORMANCE



Goal: 100% Pcl-Pdl Design with 10% Total Delay

Optimize utilization ... avoid unnecessary machine start-up

- Focus on total delay to increase net hours, machine throughput and plant utilization
- Eliminate tradeoffs between waste, speed or delay

FOURTH GATE: COST OPTIMIZATION

Fourth Gate

Cost
Optimization

Total Cost
Management

Raw material

+

Conversion

+

Fixed Cost



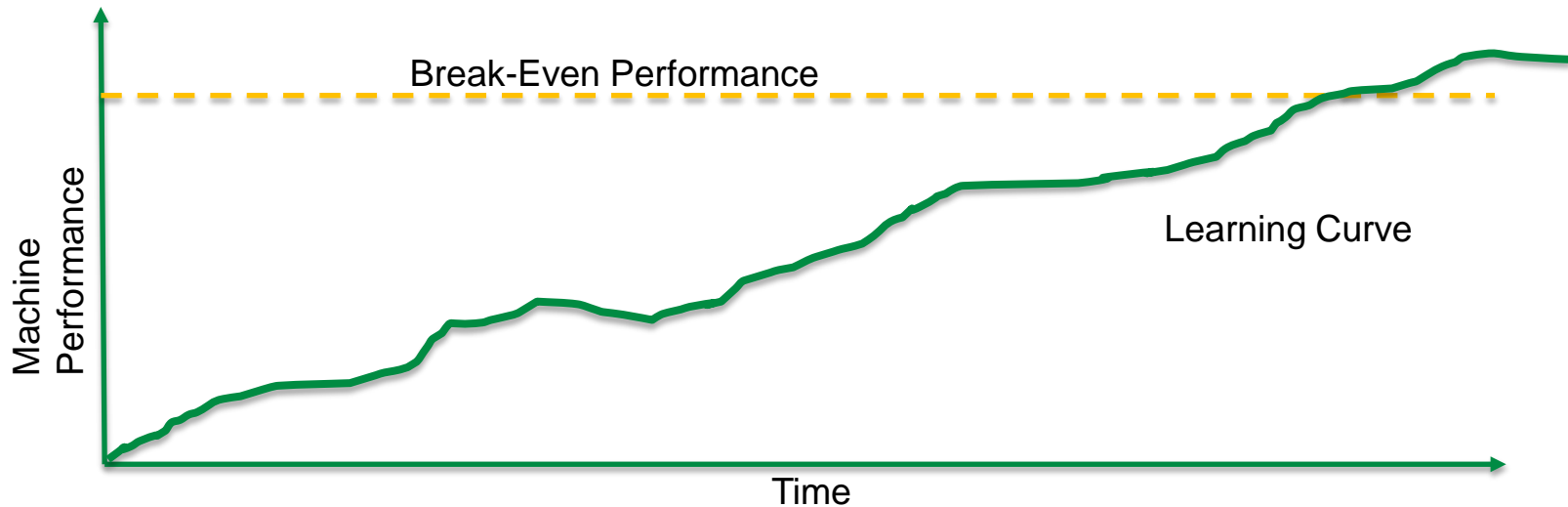
Goal: Tight cost control as we add capacity to deliver within Guidance of 20-25% EBIT

Drive total cost efficiencies ... understand financial tradeoffs

- Improve machine throughput
- Reduce finishing hours
- Optimize fixed cost structure
- Increase total yield
- Reformulate mix
- Plan network to optimize total landed cost

START-UP PERFORMANCE

KEY CONCEPTS FOR OUR START-UPS



Historical Start-Up Approach

- ➡ Focus on time to break-even performance
- ➡ Machine speed used as primary measure of progress

Historical Start-Up Approach

- ➡ Low material yield results in high cost learning curve
- ➡ Start-up line focus results in total site performance decline

PLANT CITY START-UP APPROACH

Operational Concepts

- Maximize learning per dollar spent on the start-up
- Minimize volume produced at a premium to the next alternative volume

Organizational Concepts

- Firewall the start-up organization
- Separate the “start-up” team into a planning team and an execution team
- Minimize “new-in-position” employees

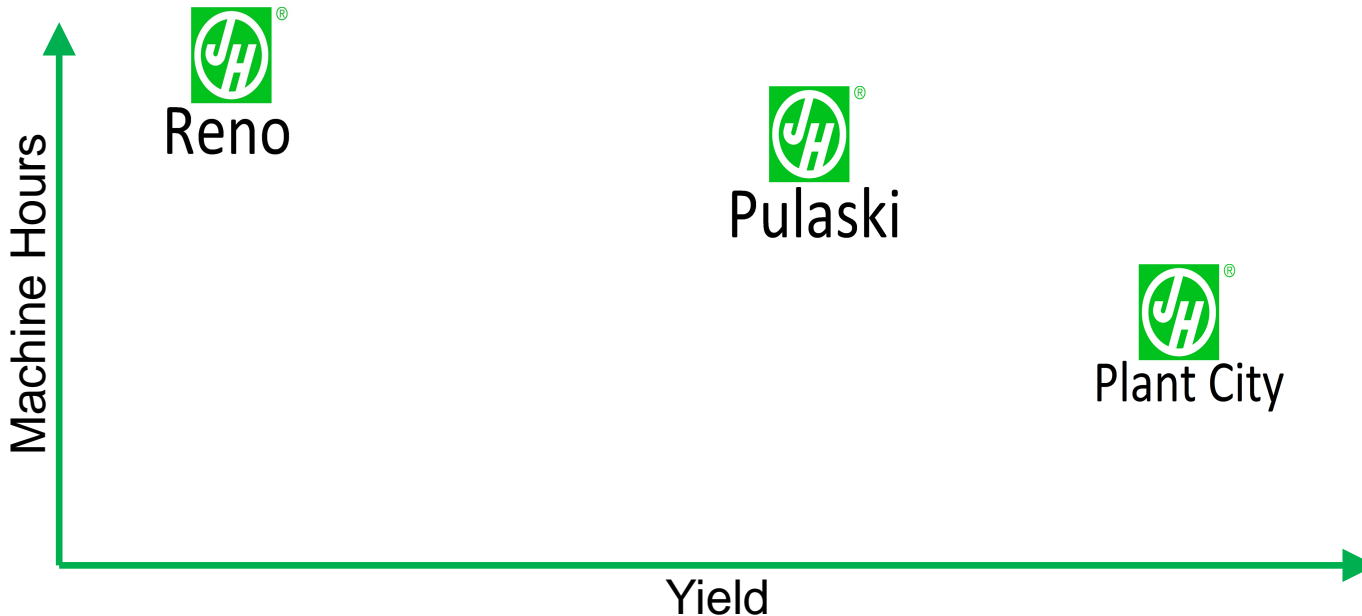
Game Plan Design

Approach designed to minimize the cost of learning with a focus on material yield



PLANT CITY VS. RECENT NA START-UPS

Lowering Cost per Learning to Achieve Similar Efficiency



Plant City 4 is delivering significantly higher yield and similar machine performance with half the gross hours run – significantly lowering our “cost of learning”

SUMMARY

- ➔ **JH manufacturing capabilities continue to provide a significant source of competitive advantage**
- ➔ **Our gate philosophy in our approach to plant operations provides clarity for organization to deliver continuous improvement**
- ➔ **Significant progress has been made in our approach to capacity ramp-ups with Plant City 4 – learnings will be applied to Cleburne**