Shibaura Machine

Driving Success with All-Electric Injection Molding Machines

A Productivity & Sustainability Comparison

Shibaura Machine

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Executive Summary

In today's competitive manufacturing landscape, achieving operational excellence is essential. All-electric injection molding machines provide a transformative solution, delivering unparalleled productivity and efficiency while supporting sustainability goals. This whitepaper explores the key advantages of transitioning to all-electric technology and how it positions manufacturers for success in an increasingly demanding industry.

The primary benefits of all-electric machines include:

- **Faster Cycle Times:** Achieve an average 10–15% increase in production rates compared to servo-hydraulic systems, driving higher throughput and significant cost savings.
- **Lower Scrap Rates:** Enhanced precision and consistency reduce material waste by approximately 1–2%, leading to measurable material cost savings.
- **Reduced Operating Costs:** All-electric machines deliver annual energy savings of 30–50% while eliminating the oil cooling requirements, substantially cutting operating costs.
- **Minimal Maintenance:** Electric machines require less upkeep, lowering maintenance costs and improving uptime by avoiding issues associated with hydraulic components.
- **Environmental Benefits:** By reducing energy consumption, emissions, and waste, all-electric technology supports sustainability initiatives and ensures compliance with environmental regulations.

To unlock potential savings and operational improvements for your business, request a customized productivity audit.

This tailored analysis will quantify the benefits of adopting all-electric technology and show exactly how it can optimize your operations.

Beyond Productivity

This whitepaper highlights the advantages of leveraging the Industrial Internet of Things (IIoT), focusing on Shibaura Machine's machiNetCloud IIoT solution. Featuring the SUSTAIN App, this powerful IIoT solution allows manufacturers to track carbon emissions and optimize energy efficiency, driving both operational and sustainability goals.

Introduction

Rethinking Manufacturing Efficiency

In manufacturing, achieving consistent productivity and efficiency is essential. For decades, servo-hydraulic injection molding machines have been a staple in production environments. While reliable, these machines come with inherent inefficiencies that limit their potential. High energy consumption, frequent maintenance requirements, and slower cycle times often result in increased costs and reduced operational effectiveness.

As the demand for more precise, cost-effective, and sustainable solutions grows, manufacturers must upgrade their processes to meet modern expectations.

All-electric injection molding machines offer a transformative solution to these challenges. By eliminating the reliance on hydraulics, these machines leverage advanced servo-motor-driven systems to deliver superior performance.

The Results

Faster cycle times, reduced scrap rates, and significantly lower operating costs. Beyond productivity, all-electric machines boast a smaller environmental footprint, aligning with sustainability goals and regulatory requirements.

This whitepaper is tailored for engineers, business leaders, and procurement managers committed to enhancing productivity while minimizing costs. It provides actionable insights into the measurable benefits of transitioning to all-electric technology, guiding decision-makers toward operational excellence and long-term competitiveness.

Core Productivity Advantages

For manufacturers, speed and precision are key drivers of productivity. All-electric injection molding machines deliver significant improvements in both areas compared to traditional servo-hydraulic systems.

1. Faster Cycle Time

Servo-hydraulic machines often experience slower cycle times due to the inherent limitations of their hydraulic systems.

In contrast, all-electric machines utilize advanced servo-motor-driven technology to enhance repeatable productivity and enable simultaneous motions, such as eject-on-the-fly and mold movement during screw charging. These features significantly reduce cycle times and boost overall efficiency.

Efficiency Comparison:
All-Electric vs. Servo-Hydraulic Machine

A case study comparing a European servo-hydraulic machine and the Shibaura EC390SXIII all-electric machine illustrates this difference. Both machines were evaluated using a shot size of 6.5 ounces of polypropylene (PP) for the Ford F150 Lightning center console cup holder.

Cycle Times

Servo-Hydraulic:
30.8 seconds

All-Electric:
27.6 seconds

This 10.39% improvement in production rate translates into substantial value.

For a manufacturer operating 4,000 hours annually, the faster cycle time of the all-electric machine increases production capacity and results in an **annual gain of $16,624.00.**

2. Lower Scrap Rates

Precision is another area where all-electric machines excel. Their advanced control systems ensure process repeatability, reducing the risk of defects that lead to material waste.

Manufacturers transitioning to all-electric systems typically experience a **1–2% reduction in material waste**, leading to substantial annual cost savings. This improvement not only reduces material expenses but also minimizes environmental impact, aligning with sustainability goals and reducing overall production waste.

3. Reduced Maintenance Costs

Servo-hydraulic machines require ongoing maintenance, including regular oil changes, filter replacements, and repairs to hydraulic components. These recurring tasks increase operational overhead and disrupt production schedules. Additionally, the heat generated by hydraulic systems places a significant demand on the plant's cooling load, causing wear and tear on cooling equipment and driving up associated maintenance costs.

In contrast, all-electric machines eliminate the need for hydraulic components entirely, resulting in significantly lower maintenance requirements. Without hydraulic systems, the heat output is drastically reduced, alleviating strain on the plant's cooling systems. This reduction decreases maintenance and energy demands for chillers and other cooling equipment.

By minimizing maintenance needs and downtime, all-electric machines enhance operational efficiency while delivering long-term cost savings.

4. Improved Uptime

All-electric machines significantly enhance uptime by eliminating the risks associated with hydraulic systems, such as leaks, overheating, and mechanical failures. These common issues in servo-hydraulic machines often lead to unplanned downtime and production interruptions.
In addition, all-electric machines streamline the startup process. Servo-hydraulic machines typically require an oil preheating period before operation, which increases power consumption, prolongs startup times, and generates additional scrap during the warm-up phase.

In contrast, all-electric machines are ready to operate almost immediately, reducing delays, minimizing waste, and ensuring more consistent performance. These advantages make all-electric systems a reliable choice for manufacturers prioritizing operational efficiency and uninterrupted production.

5. Elimination of Housekeeping Costs

Servo-hydraulic machines often necessitate daily cleanup of spilled oil, consuming valuable labor hours and adding to operational costs. In contrast, all-electric machines eliminate the use of oil entirely, saving manufacturers time and money associated with housekeeping. This not only reduces labor costs but also creates a cleaner, safer, and more efficient work environment, further enhancing operational effectiveness.

Maximizing Value Beyond Productivity

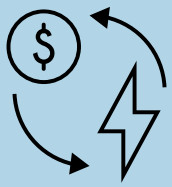
All-electric injection molding machines go beyond productivity gains, offering efficiency, sustainability, and cost-effectiveness to meet modern manufacturing challenges and drive long-term success.

Energy Efficiency

Energy consumption is a critical driver of manufacturing costs, and all-electric machines significantly outperform servo-hydraulic systems in this area. Continuing with the same case study comparing the European servo-hydraulic machine with the Shibaura EC390SXIII all-electric machine highlights this difference:

Power Consumption:
Servo-Hydraulic Machine: 11.6 kW/hour
Shibaura All-Electric: 3.7 kW/hour

Annual Energy Costs:
(Based on 4,000 operating hours at $0.08 per kW-hour)
Servo-Hydraulic: $3,712.00
Shibaura All-Electric: $1,184.00



Annual Energy Savings:
$2,528.00

Additionally, servo-hydraulic systems generate significant heat, necessitating additional cooling through heat exchangers and water. This results in further operational complexity and costs:

Cooling Load (tons):
Servo-Hydraulic Machine: 3
Shibaura All-Electric Machine: 0

Cooling Energy Costs
Servo-Hydraulic Machine: $201.60
Shibaura All-Electric Machine: $0

Cooling Power Consumption:
Servo-Hydraulic: 0.633 kw/hour
Shibaura All-Electric: 0 kw/hour

Makeup Water Cost ($)
Servo-Hydraulic: $200
Shibaura All-Electric: $0

Annual Cooling Savings: $401.60

Maximizing Value Beyond Productivity

Sustainability

Sustainability is no longer optional for manufacturers aiming to stay competitive. All-electric injection molding machines provide a cleaner, greener alternative to traditional servo-hydraulic systems. While these machines deliver significant energy efficiency on their own, integrating Shibaura's machiNetCloud IIoT solution takes sustainability to the next level.

This integration allows manufacturers to not only meet environmental targets but also gain a deeper understanding of their operations. With actionable data from the machiNetCloud solution, manufacturers can unlock even greater efficiency and sustainability gains.

The machiNetCloud solution, featuring the SUSTAIN App, can be seamlessly integrated with all-electric machines to provide advanced insights and optimization tools.

> "With their inherent advantages and the optional integration of the machiNetCloud IIoT solution, all-electric injection molding machines allow manufacturers to achieve a unique balance of productivity, cost efficiency, and sustainability.
>
> Whether used as standalone technology or enhanced with IIoT capabilities, they represent the future of competitive manufacturing."

Chuck Gorman
National Sales Manager, Deputy Manager, Injection Molding
Shibaura Machine Company, America

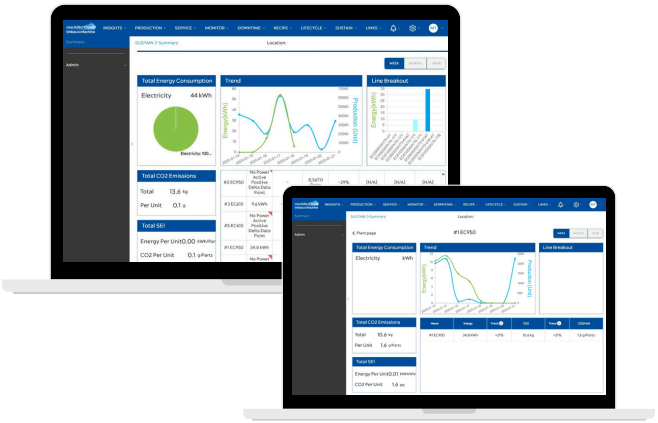
machiNetCloud

Technology Spotlight

In today's data-driven manufacturing environment, actionable insights are critical for optimizing operations and achieving sustainability goals. Shibaura's machiNetCloud IIoT solution, featuring the **SUSTAIN App**, allows manufacturers to seamlessly integrate advanced analytics and monitoring capabilities into their processes.

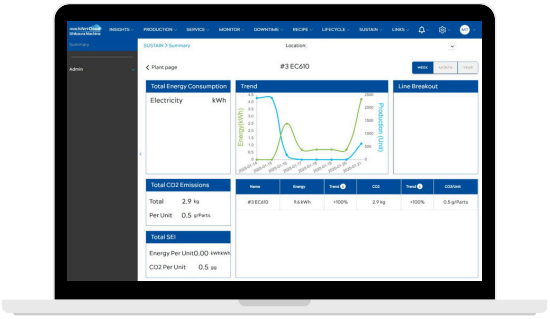
This technology further boosts the productivity of all-electric injection molding machines, unlocking new opportunities for efficiency and environmental compliance.

Key Features



Comprehensive Sustainability Key Performance Indicators (KPIs):

- Aggregate key metrics, including energy use, emissions, and production data, across machines and facilities.
- Provide a holistic view of environmental impact, enabling manufacturers to make informed, proactive decisions.

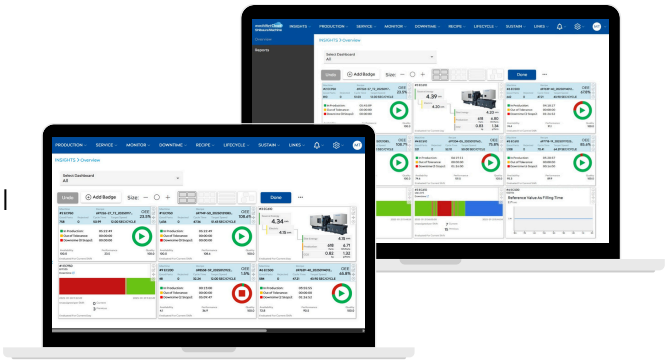


Real-Time Energy Monitoring & Optimization:

- Continuously track energy consumption at the machine and process levels.
- Utilize machine learning algorithms to identify inefficiencies and optimize energy use, reducing costs per unit produced.

Carbon Footprint Tracking:

- Measure and report carbon emissions for every part produced.
- Ensure compliance with Scope 1 and 2 emissions regulations, satisfying internal goals and external requirements.
- Build trust with environmentally conscious stakeholders.



QUANTITATIVE CASE STUDY

Electric vs. Servo-Hydraulic Operating Cost Comparison

This case study continues to compare the European servo-hydraulic machine injection molding machine with the Shibaura EC390SXIII all-electric injection molding machine. Both machines were evaluated using a shot size of 6.5 ounces of polypropylene (PP) for the Ford F150 Lightning center console cup holder. The analysis focuses on key metrics based around 4,000 hours of annual machine operation.

Productivity Gains

Cycle Times (seconds):
Servo-Hydraulic: 30.8 | All-Electric: 27.6
Increased Production Rate: 10.39%
Annual Gains (@ $40.00/hr): $16,624.00

Housekeeping Savings

Daily Cleanup Time: 15 minutes/day
Cleanup Time (333 working days): 83.25 hrs
Labor Rate (with benefits): $20.00/hr
Annual Savings: $1,665.00

Power Savings

Machine Power Consumption (kW/hour):
Servo-Hydraulic: 11.6 | All-Electric: 3.7
Annual Energy ($0.08/kWh):
Servo-Hydraulic: $3,712.00
All-Electric: $1,184.00
Annual Savings: $2,528.00

Cooling Savings

Hydraulic Cooling Costs:
Power Consumption: $201.60
Make-Up Water: $200.00
Total Hydraulic Cooling: $401.60/year
All-Electric Cooling: $0.00/year
Annual Savings: $401.60

Maintenance Savings

Hydraulic Maintenance: $4,720.00/year
All-Electric Maintenance: $910.00/year
Annual Savings: $3,810.00

Material Savings

Part Weight: 6.5 ounces | Mold Cavity: 2
Material Savings: 1.5%
Annual Material Cost: $126,360.00
Annual Savings: $1,895.40

Total Annual Benefit: $26,924.00

Your Blueprint to Optimizing OEE

Request a Productivity Audit

Take the next step toward transforming your manufacturing operations with a customized productivity audit from Shibaura Machine Company, America. Our team will analyze your current injection molding processes, identify inefficiencies, and provide a comprehensive report detailing the potential savings and improvements you can achieve by transitioning to all-electric injection molding machines.

A tailored audit includes:

- A detailed assessment of your energy, material, and maintenance costs.
- Projected productivity gains, including faster cycle times and reduced scrap rates.
- A clear, actionable ROI report to help you make informed decisions about upgrading your equipment.

By participating in a productivity audit, you'll gain valuable insights into how all-electric technology can give your business a competitive edge. Contact Shibaura Machine Company, America to discover your potential savings and operational improvements.

Shaping the Future of Manufacturing Excellence

All-electric injection molding machines are more than just an upgrade—they are a game-changing solution for manufacturers looking to enhance productivity, reduce costs, and achieve sustainability goals. With faster cycle times, lower scrap rates, and reduced maintenance requirements, these machines offer unparalleled operational efficiency.

Additionally, their energy savings and compatibility with sustainability tools like Shibaura's **machiNetCloud IIoT solution** ensure compliance with today's environmental standards.

Shibaura Machine stands at the forefront of innovation in the plastics industry, delivering cutting-edge technology designed to meet the evolving needs of manufacturers. We are committed to provide tools that drive success and set you apart in a competitive market.

The time to innovate is now. Discover how Shibaura Machine Company, America can help you achieve measurable results and long-term growth.

Contact Us

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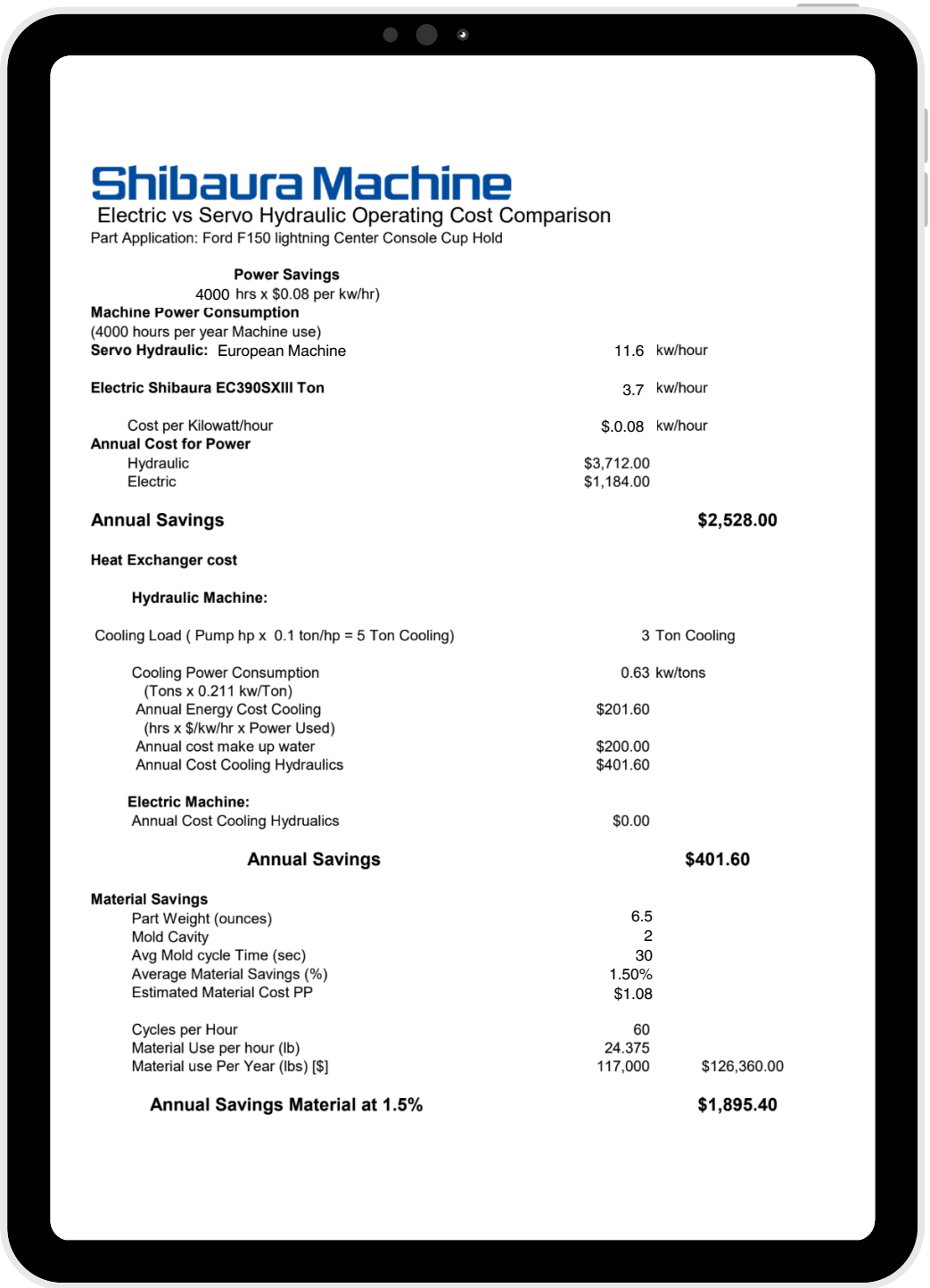
Appendix



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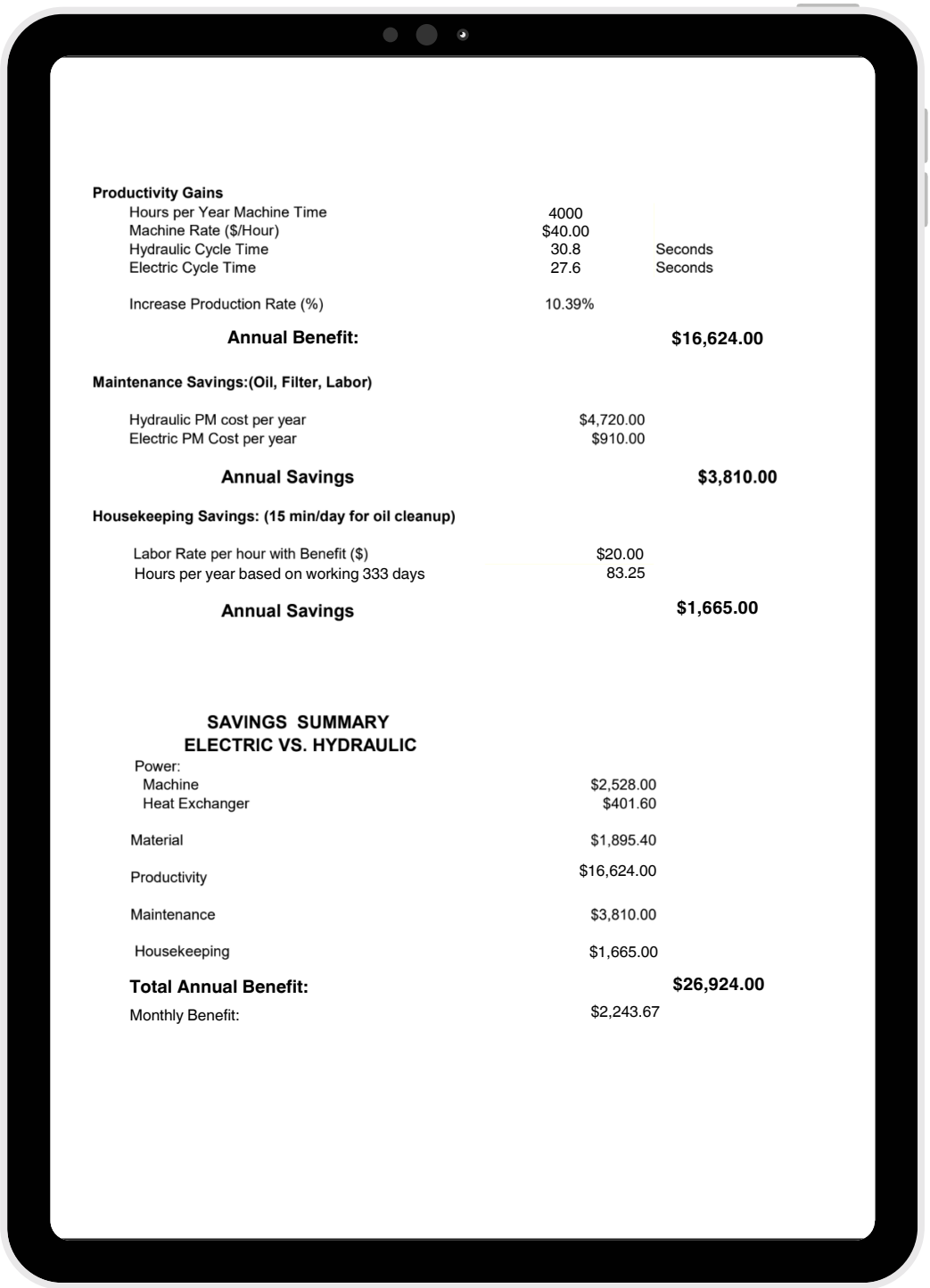
Electric vs Servo Hydraulic Operating Cost Comparison

Part Application: Ford F150 lightning Center Console Cup Hold

Power Savings			
4000 hrs x $0.08 per kw/hr)			
Machine Power Consumption			
(4000 hours per year Machine use)			
Servo Hydraulic: European Machine	11.6	kw/hour	
Electric Shibaura EC390SXIII Ton	3.7	kw/hour	
Cost per Kilowatt/hour	$.0.08	kw/hour	
Annual Cost for Power			
Hydraulic	$3,712.00		
Electric	$1,184.00		
Annual Savings			**$2,528.00**
Heat Exchanger cost			
Hydraulic Machine:			
Cooling Load (Pump hp x 0.1 ton/hp = 5 Ton Cooling)	3	Ton Cooling	
Cooling Power Consumption (Tons x 0.211 kw/Ton)	0.63	kw/tons	
Annual Energy Cost Cooling (hrs x $/kw/hr x Power Used)	$201.60		
Annual cost make up water	$200.00		
Annual Cost Cooling Hydraulics	$401.60		
Electric Machine:			
Annual Cost Cooling Hydrualics	$0.00		
Annual Savings			**$401.60**
Material Savings			
Part Weight (ounces)	6.5		
Mold Cavity	2		
Avg Mold cycle Time (sec)	30		
Average Material Savings (%)	1.50%		
Estimated Material Cost PP	$1.08		
Cycles per Hour	60		
Material Use per hour (lb)	24.375		
Material use Per Year (lbs) [$]	117,000		$126,360.00
Annual Savings Material at 1.5%			**$1,895.40**

Appendix



Productivity Gains

Hours per Year Machine Time	4000	
Machine Rate ($/Hour)	$40.00	
Hydraulic Cycle Time	30.8	Seconds
Electric Cycle Time	27.6	Seconds
Increase Production Rate (%)	10.39%	
Annual Benefit:		**$16,624.00**

Maintenance Savings:(Oil, Filter, Labor)

Hydraulic PM cost per year	$4,720.00	
Electric PM Cost per year	$910.00	
Annual Savings		**$3,810.00**

Housekeeping Savings: (15 min/day for oil cleanup)

Labor Rate per hour with Benefit ($)	$20.00	
Hours per year based on working 333 days	83.25	
Annual Savings		**$1,665.00**

SAVINGS SUMMARY
ELECTRIC VS. HYDRAULIC

Power:		
Machine	$2,528.00	
Heat Exchanger	$401.60	
Material	$1,895.40	
Productivity	$16,624.00	
Maintenance	$3,810.00	
Housekeeping	$1,665.00	
Total Annual Benefit:		**$26,924.00**
Monthly Benefit:	$2,243.67	