FOCUS AREAS

PFNA MANUFACTURING

PEPSICO LABS

1. Sustainable Manufacturing

2. Frontline Digitalization

3. Digitized Quality & Food Safety

4. Next-gen Process Controls & Advanced automation

5. Preventative / smart maintenance

External Brief

1 - SUSTAINABLE MANUFACTURING PRACTICES

1.1 Plant Electrification

- **Energy Storage**: Onsite electricity & energy storage that enables both electrification at the site and lower grid capacity needed to run plants."
- **"Solar Energy**: Breakthrough technology in thermal solar for water/hydrogen energy harvesting"
- **Next Generation Biomass**: Breakthrough bio-mass technologies for green & brownfield deployment

1.2 Predictive Energy Management Systems

Site Energy Management System (Energy Control Room)

- **Control Tower**: Intelligent control tower for site energy consumption with AI/ML generated real time actions/Response tracking.
- **Next gen metering:** Enable equipment level metering through ultra low cost / low infrastructure solution e.g. IOT / "Soft" smart metering.

1.3 Heat recovery & lower-energy alternatives

Advance equipment or materials to reduce thermal energy consumption

- **Heat Pumps**: Breakthrough technology for Low-heat recovery and waste heat recovery
- High efficiency **electric boilers** (Low power/grid demand industrial hot water generation)
- **High-efficiency Electric Air Compressors:** Breakthrough technology to provide ultra-high-efficient compressed air in Snack food manufacturing"
- **Building design:** New tech to improved energy-efficient building design & new tech to enable low-cost, retrofit thermal insulation solutions

1.4 Advanced Water Reclamation, Reduction, and Recycling

Emerging water reduction technologies

- **Low energy water treatment:** Low energy wastewater reclamation technologies for zero-waste water
- **Hygiene Tech:** Low-water or no-water sanitation technologies and chemicals
- **Control Tower**: Intelligent control tower for site water consumption with AI/ML generated real time actions/Response tracking.
- **Water Meters**: Ultra low cost smart water metering

External Brief

PepsiCo Labs is looking for Breakthrough Technology for Manufacturing

1. Sustainable manufacturing practices	Technology Required
1.1 Plant Electrification: Alternatives Energy Generation and Storage for manufacturing (incl Microgrid tech)	• Onsite high-capacity electricity & energy storage systems & associated Microgrid enabling technology

	• Next Generation Solar
	  • PV for water/hydrogen energy harvesting
	  • PV panels with a coating to stop oil residue from sticking on panels

	• Next Generation Biomass systems
1.2 Predictive Energy Management Systems: Intelligent Energy Management System (Energy Control Tower) Ultra-low-cost utilities metering	• Intelligent control tower for site energy consumption with AI/ML generated real time actions/Response tracking
	• Ultra-low cost / low infrastructure solution e.g. OIT / “Soft” smart metering
1.3 Heat recovery & lower-energy alternatives: Breakthrough technology for energy recovery & loss prevention	• Advanced heat pump technology (boiler/process stack heat recovery)
	• High-efficiency electric boilers (Steam/Water)
	• High-efficiency Electric Air Compressors
	• Building & equipment solutions to reduce heat/energy loss/heat transfer
1.4 Advanced Water Reclamation, Reduction, and Recycling: Emerging technologies to drive Net Water Positive strategy	• Low-energy wastewater treatment
	• Low-water or no-water sanitation technologies
	• E2E water smart management platform for production facilities
	• Ultra-low-cost smart water meters

2 - FRONTLINE PROCESS DIGITALIZATION

2.1 Digitalization to Paperless Factory

Reduction, Optimization, and Digitization of Forms and Daily processes

- **Digitalize Processes:** Technology to enable digitalization of standard operational paperwork/forms to digital version
- **Control tower for digitalized processes**: leverage data compiled in digital forms (i.e. see above) and enable intelligent (smart) tracking & predict anomalous event in the manufacturing process. Example:

2.2 Low/No-touch Processes

Implement news ways of working with digital low-touch or no-touch processes for our frontline teams

- **Automate of manual checks:** New technology to replace manual checks e.g. product attribute testing/checks & raw ingredients testing.
- **Product Control tower:** Leverage existing and new sensor technology to drive digital dashboards control philosophy

2.3 Daily Task and Work Orchestration

Smart Platform for daily individual and team task coordination

- **Smart Work Management Platform:** Work management aggregation & digital twin platform to bring in enterprise-wide information to provide near real-time labor & task coordination to enable optimized daily work schedules.

2.4 Advanced Learning and Development

Technologically advanced L&D systems and advanced predictive troubleshooting tools

- **Visual based guided learning:** Training hardware and low-code content creation for “on-job” guidance/best practice (AR/VR/iPad)
- **Best Practice Chatbot:** AI Integrated (i.e. Chatbot) technology for learning and development and on-the-job troubleshooting

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2. Frontline process digitalization	Technology Required
2.1 Digitalization to Paperless Factory Digitalize Processes: Technology to enable digitalization of standard operational paperwork/forms to digital version	Digital manufacturing platforms – Digitalization of standard operational paperwork/forms
	Digital manufacturing platforms – Smart AI/Data Analytics toolkit to for digitized forms
2.2 Low/No-touch Processes Implement news ways of working with digital low-touch or no-touch processes & AI/ML Close loop control (Control tower)	Sensor Technology for Product Attribute Testing (IoT) • Product moisture (chip, cornmeal, masa) • Bulk Density • Vision systems for Visual product attributes (colour, blisters, size) • Oil analysis (FFAs, OV) inc. handheld FTIR & oil type verification *[Sensor must interface with PepsiCo IOT platform]*
	Digital manufacturing platform : Smart platform to drive digital dashboards control philosophy
2.3 Daily Task and Work Orchestration Digital twin production & labour modelling platform for daily scheduling & individual/team task coordination	• Digital manufacturing platform • Digital Twin for production & labour modelling
2.4 Advanced Learning and Development Technologically advanced L&D systems and advanced predictive troubleshooting tools to get frontlines team upskilled quicker, safer and cheaper	Manufacturing focused tech platforms to support : • Rapid VR/AR content creation • Chatbot tech for “on-job” guidance/best practice • Rapid visual toolkit creation for “on-job” guidance/best practice

3 INTELLIGENT OPERATIONS – DIGITAL QUALITY & FOOD SAFETY

3.1 Digitalized Quality Control & Auditing

Digitalize manual checks & audit processes smart digital forms & process

- **Digitalize Processes:** Technology to enable digitalization of quality process paperwork/forms to digital version with AI/ML for audit processes and Quality Control
- **Control tower for Food Safety compliance**: Configurable digital tools for manual and automated process/quality/hygiene compliance monitoring (inc. Pathogen testing, Hygiene/Allergen clean validations, MSS compliance, Etc.

3.2 Smart Quality Process Control

Automated and Predictive Product Attribute Center Lining

- **Smart Process Control**: Control tower approach leveraging AI/ML to provide close loop automation controls to maintain product centerline & maximize throughput

3.3 Advanced Food Safety Inspections Systems

Rapid detection for quality anomalies throughout manufacturing processes

- **Vision System:** Vision systems to detect real-time product or process anomalies.
- **Advanced Inspection:** Breakthrough technology to enhance hygiene inspections i.e. deep clean / Allergen clean Inspection
- **AI Vision Hardware:** Modular hardware (camera, sensor, etc.) for quick deployment into production environment

3.4 End to End Traceability

Smart product & Ingredient traceability through advanced technology

- **End to End Finished Goods Traceability:** Advanced product (finished goods) tracking throughout the supply chain
- **End to End Ingredient Traceability:** Advanced base ingredient / raw material tracking throughout the supply chain

External Brief

PepsiCo Labs is looking for Breakthrough Technology for Manufacturing

3. Fully digitized quality systems	Technology Required
3.1 Digitalized Quality Control & auditing Digitalize manual checks & audit processes smart digital forms & process	Manufacturing Quality & Food Safety Platform • Digitalization of forms, audits, testing & compliance
	Manufacturing Quality & Food Safety Platform • Digital Twin for Food Safety & compliance monitoring (inc. Pathogen testing, Hygiene/Allergen clean validations, MSS compliance, Etc.)
3.2 Intelligent Quality Process Control Control tower approach leveraging AI/ML to provide close loop automation controls to maintain product centreline & maximize throughput	• Digital Process Twin • Intelligent process control
3.3 Advanced Food Safety Inspections Systems Technology to enable rapid detection and prevention of cross-contamination risks throughout the manufacturing processes	• Vision system • Advanced sensor-based inspection systems (taste, texture, appearance) • Handheld hygiene inspection tools • Oil analysis (FFAs, OV) inc. handheld FTIR & oil type verification
3.4 Advanced Traceability: Smart product & Ingredient traceability through advanced technology	Manufacturing Product Traceability Platform • Smart control tower for product traceability • On-Pack unique ID print & product association & traceability
	Advanced ingredient traceability • No-Touch digital chain of custody • Digital ingredient traceability platform

4 4. NEXT-GEN PROCESS CONTROL & AUTOMATION

4.1 Advanced Process Control

Optimize process throughput through digital twin & smart process control

- **Digital Twin simulation:** Digital Twin technology to simulate real-world end-to-end manufacturing processes with AI/ML optimized throughput recommendations & bottleneck detection (unlock scheduling constraints)
- **Smart Process Control**: Control tower approach leveraging AI/ML to provide close loop automation controls to maintain product centerline & maximize throughput

4.2 Advanced Equipment Control

Optimize equipment performance through smart process control

- **Smart Product Control**: Control tower approach leveraging AI/ML to direct operator intervention for waste reduction, equipment downtime prevention & response (e.g. Film waste, product validation)
- **Control tower for HMI:** Smart control tower management of OIT/Equipment level alarms feeding into HMI (Wonderware) to provide prioritization of alarms based of AI/M.

4.3 Breakthrough Automation

Open brief

- AMR/AGV for Raw material storage and retrieval
- Vision/Sensor based fire detection systems (area monitoring)
- Sanitation Technology (automation/zero water)
- Advanced film defect detection (X-ray, etc.)
- Automation of Product Labs testing

External Brief

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4. Breakthrough Process Controls & Advanced automation	Technology Required
4.1 Digital Twin & Smart Process Control Optimize process throughput through digital twin & smart process control	• Digital Process Twin • Smart Process control platforms (AI/ML based)
4.2 Advanced Equipment Control Optimize equipment performance through smart process control platforms.	• Digital manufacturing platforms – Smart AI/Data Machine performance analytics toolkits • Process health platform (AI/ML) • Equipment digital twin
	• MHI Control tower: AI/ML Alarm prioritization
4.3 Breakthrough manufacturing automation: Open Brief Breakthrough CPG focused automation & Technology for specific use cases	Open brief: breakthrough technology for manufacturing that could transform our processes and/or increase our sustainability within our plants including : • AMR/AGV for Raw material storage and retrieval • Vision/Sensor based fire detection systems (area monitoring) • Advanced product inspection (packaging defects) • Sanitation/Cleaning Automation • Automation of Product Labs testing

5 PREVENTATIVE / SMART MAINTENANCE

5.1 Predictive Condition & System Monitoring

Provide predictive solutions that eliminate failures of equipment and entire manufacturing systems

- **Monitoring & Insights:** Advanced condition-based monitoring sensors with embedded AI and analytics
- **Wide Area Monitoring:** Breakthrough low cost technologies to enable monitoring of large area equipment e.g. Belt & transfer conveyors.

5.2 Rapid Downtime Response

Minimize repair time of critical failures with tools and technology readily available to teams

- **On-site Spare Parts Production:** Ability to rapidly produce (internally or via third-party) spare parts on demand (e.g. 3-D Printing)
- **Next Gen Inventory Control:** Advanced parts inventory management and tracking through digital tools (RFID/2D-Matrix and Software)

5.3 Advanced Maintenance Planning

Orchestrate and optimize maintenance planning based on need and priority versus set schedules

- **Maintenance Control Tower**: Digital scheduling tools that easily integrate into existing EAM and enterprise applications. Platform level tools leverage existing equipment/hardware data and execution information to optimize daily/weekly MX task

5.4 Mechanic of the Future

Enable new ways of working for our Maintenance teams through digital tools, service providers, & emerging technologies

- **Remote Maintenance:** New technology to enable maintenance by proximity. Equipment information and troubleshooting tools available to enable remote problem solving.
- **Maintenance as a service**: Automation as a Service & Maintenance as a Service providers to deliver new insights and flexibility in staffing models

Focus Terrains

PepsiCo Labs is looking for Breakthrough Technology for Manufacturing

5. Preventative / smart maintenance	Technology Required
5.1 Predictive Condition & System Monitoring Intelligent predictive solutions that eliminate failures of equipment and entire manufacturing systems incl AI based condition-based monitoring	• Advanced IOT equipment condition monitoring sensors
5.2 Rapid Downtime Response Minimize repair time of critical failures with tools and technology readily available to teams incl 3D printing parts, inventory tracking of raw materials	• 3rd Party 3D Printing/CNC Services (Rapid Response) • Advanced 3d Print & Scanning Technology
	• Advanced parts inventory management platform
5.3 Advanced Maintenance Planning Orchestrate and optimize maintenance planning based on need and priority versus set schedules	• Maintenance planning Platforms
5.4 Mechanic of the Future (incl Learning & Development) Enable new ways of working for our Maintenance teams through digital tools, service providers, & emerging technologies incl maintenance-as-a-service	Technology support hub • Remote technical support platform • AR/VR/XR Technical support technology
	• 3rd Party Maintenance-as-a-service providers
	• Flex-Technical labour provider