ESP-32 BASED WATER TANK PROJECT

PROJECT PROPOSAL

PREPARED FOR

MICHELIN LANKA (PVT) LTD.

PREPARED BY

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VERSION HISTORY

VERSION	APPROVED BY	REVISION DATE	DESCRIPTION OF CHANGE	AUTHOR

PROPOSAL DETAILS

PROJECT TITLE	ESP-32 Based Water Tank Project		
SUBMITTED BY	Eng. Milan Harsha Kumara Mr. J.C.B. Kehelwattha Mr. P.D.N.D. Silva	PROJECT TYPE	Operational
PHONE / EMAIL	harsha.kumara@michelin.com seuintern2024@outlook.com	TOTAL ESTIMATED BUDGET	Rs. 994,887.30
DATE OF PROPOSAL	2024/04/03	VERSION NO.	1.0
PROJECTED START DATE		PROJECTED COMPLETION DATE	2024-04-29

EXECUTIVE SUMMARY

The project focuses on modernizing the traditional electrical panel board of water tank by integrating advanced ESP-32 based electronic controller. The conventional panel boards have limitations in terms of efficiency, safety, and functionality. By transitioning to electronic controllers, we aim to enhance the management, monitoring, and control of water tank systems, ultimately improving user experience and resource utilization.

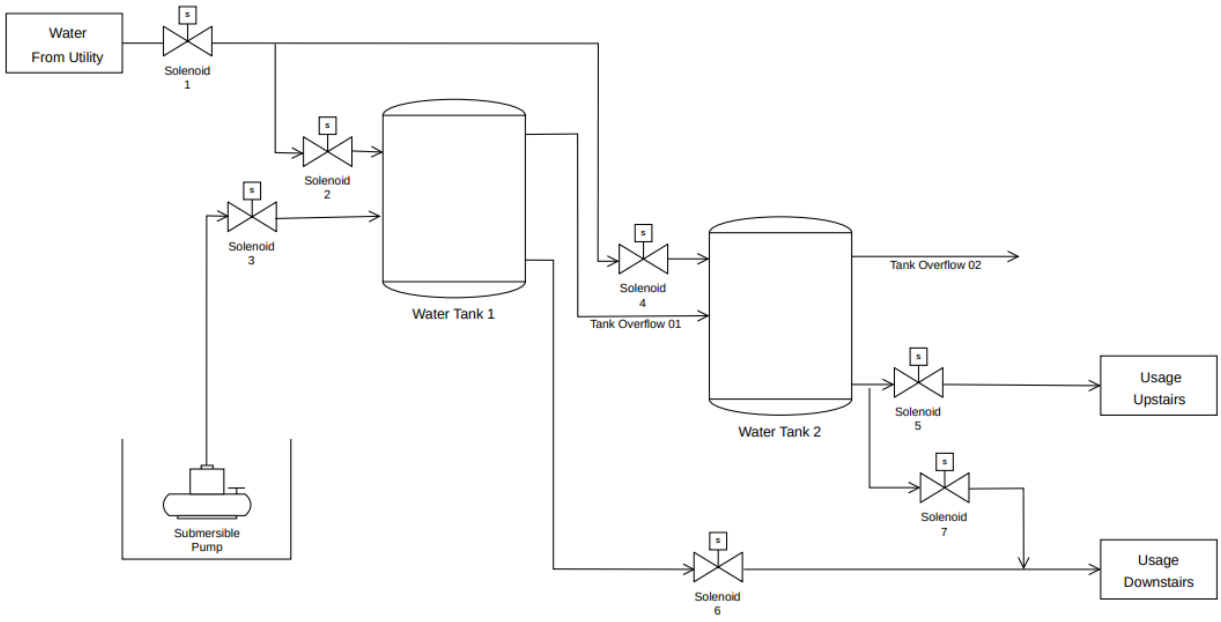

Figure 1: Proposed project diagram

INTRODUCTION

In today's rapidly evolving technological landscape, businesses across various industries are constantly seeking innovative solutions to enhance efficiency, streamline operations, and improve user experience. Within our organization, the management of water tank systems plays a crucial role in ensuring optimal resource utilization, operational reliability, and user satisfaction. However, the existing infrastructure relying on traditional electrical panel boards for water tank control and management presents several limitations and challenges.

1. Limited Functionality: Conventional electrical panel boards offer basic control functionalities, limiting our ability to implement advanced features such as automated scheduling, remote monitoring, and predictive maintenance.
2. Manual Intervention: The reliance on manual intervention for monitoring and controlling water tank systems poses risks of human error, inefficiencies, and delays in addressing operational issues.
3. Safety Concerns: Outdated panel boards may lack integrated safety mechanisms, increasing the risk of electrical faults, leaks, and other hazardous incidents.
4. Resource Inefficiency: Without intelligent control algorithms, water tank systems may consume excessive energy and water, leading to unnecessary costs and environmental impact.
5. Lack of Scalability: As our organization grows and expands, the current infrastructure may not accommodate future requirements, necessitating costly upgrades or replacements.

GOALS

GOAL DESCRIPTION	KEY BENEFITS
Enhance controllability 100%* by offering finer control over various parameters such as water levels, valve position, motor status at the end of the first month.	Enhanced Controllability
Reduced Size and Weight of the system by 10%* replacing purely electrical counterparts with electronic components.	Reduced Size and Weight
Increase flexibility by 10%* in terms of functionality and adaptability by making it easy to accommodate changes in requirements or technological advancements at the end of the first month.	Increase flexibility
Advancing features enable the implementation of advanced features and functionalities such as wireless communication and real time monitoring.	Advancing features
Reducing the cost 10%* by reducing energy consumption, lowering maintenance requirements.	Low cost

SCOPE OF WORK

In-Scope:

- Electronic automation system
- Android mobile app
- Training protocols
- Improve efficiency

Out-of-Scope:

- Improving/replacing mechanical system
- Improving/replacing electro-mechanical system
- Training for staff outside the working area.

APPROACH

1. Assessment and Planning
    - Evaluate current systems for compatibility and functionality.
    - Develop a detailed implementation plan with timelines and resource allocation.

2. Procurement
    - Create Bill of Materials (BOM) for the requirement.
    - Source electronic controllers from reputable manufacturers.

3. Installation and Integration
    - Develop a prototype and conduct initial tests.
    - Deploy skilled technicians for installation and integration.
    - Conduct thorough testing to ensure seamless integration.

4. Mobile Application Development
    - Develop a prototype and conduct tests.
    - Ensure integration with existing management systems.

5. Training and Documentation
    - Develop comprehensive training materials for staff.
    - Provide detailed documentation for ongoing maintenance.

6. Quality Assurance and Monitoring
    - Implement quality assurance measures.
    - Monitor project progress and performance metrics.

DELIVERABLES

1. ESP 32 based electronic automation system to replace current electrical system.
2. Real-time status monitoring android mobile application.
3. Basic training program for the staff to adopt with new technology.
4. User manual and project report documents.

TIMELINE / MILESTONES

ACTIVITY	STATUS	WEEK							
		1	2	3	4	5	6	7	8
Evaluating current system.	Complete								
Developing a detailed implementation plan.	Needs Review								
Creating bill of materials (Bom).	Needs Review								
Source electronic controllers.	Complete								
Developing the prototype and conducting initial tests.	In Progress								
Deploying technicians for installation and integration.	Not Started								
Developing mobile app prototype and conducting tests.	In Progress								
Developing training materials for staff.	Not Started								
Creating documentation for ongoing maintenance.	Not Started								
Testing for quality assurance.	Not Started								
Implementing quality assurance measures.	Not Started								
Monitor project progress and performance metrics	Not Started								
Project Report	Not Started								

MILESTONE	DATE
Feasibility Study	2024-03-21
Implementation Plan	2024-03-25
Bill of Materials (BOM)	2024-03-28
Prototype	2024-04-10
Mobile Application	2024-04-10
Training Materials	2024-04-25
Project Report	2024-04-29

BUDGET

Description	Qty	Unit Price	Net Amount	Total
Hardware - Prototype				
ESP-32 module	1	1,690.00	1,690.00	
5V 3A Micro USB Power Adapter	1	1,100.00	1,100.00	
HC-SR04 4Pin Ultrasonic Sensor Module	3	260.00	780.00	
Optimus Mega Ultrasonic Bracket	2	100.00	200.00	
8 Way 8 Channel SSR Solid State Relay Module	1	2,950.00	2,950.00	
4 Way 4 Channel SSR Solid State Relay Module	1	1,720.00	1,720.00	
Project Board Breadboard Solderless	1	230.00	230.00	
5V 3.3V USB Type-A Breadboard Power Module	1	280.00	280.00	
Jumper wire Female-to-Female	1	140.00	140.00	
Jumper wire Male-to-Female	1	160.00	160.00	
Jumper wire Male-to-Male	1	170.00	170.00	
Electric Solenoid Valve 0.5-inch 24VDC NC Plastic Water	8	560.00	4,480.00	
Water Pump Submersible Pool Tank 12VDC 240L/H 3m	1	1,850.00	1,850.00	
Arduino Nano V3.0 Original	1	1,950.00	1,950.00	17,700.00
Hardware - Finished Product				
NORVI IIOT, ESP32 Based Industrial Microcontroller	1	32,857.33	32,857.33	
NORVI-EX-R16 Relay Output Expansion	1	31,388.10	31,388.10	
SITOP PSU100C 24 V/4 A stabilized power supply input: 120-230 V AC (110-300 V DC) output: 24 V DC/4 A	1	35,197.78	35,197.78	
MB7066 XL-MaxSonar-WR/WRC Ultrasonic Sensor, 10m, PWM, 10Hz	2	34,894.22	69,788.44	
Solenoid valve Danfoss EV250BW 10BE, G1, EPDM, NC	3	47,446.43	142,339.28	
Solenoid valve Danfoss EV220BW 15, G1, EPDM, NC	4	90,154.28	360,617.14	
230V BB, clip on coil for solenoid valve	7	12,200.08	85,400.53	
IP67 Rated Solenoid Cable plug	7	3,585.04	25,095.31	
24 VDC NC Relay	8	5,394.26	43,154.09	
Yellow Terminal Block	30	355.17	10,654.96	
Red Terminal Block	10	355.17	3,551.65	

Black Terminal Block	10	355.17	3,551.65	
30m RED PVC Insulated Copper Auto Cable (9/0.30) (1x0.65mm2)	1	2,580.00	2,580.00	
30m BLACK PVC Insulated Copper Auto Cable (9/0.30) (1x0.65mm2)	1	2,580.00	2,580.00	
30m YELLOW PVC Insulated Copper Auto Cable (9/0.30) (1x0.65mm2)	1	2,580.00	2,580.00	
100m 16/0.20 mm BLACK - TP	1	12,985.00	12,985.00	
100m 16/0.20 mm BLACK - 3C	1	15,500.00	15,500.00	
100m 24/0.20 mm Screened Cable-4C	1	21,000.00	21,000.00	
4.8mm Fully Insulated Red Female Disconnect Lug	10	45.53	455.34	
4.8mm Fully Insulated Blue Female Disconnect Lug	10	45.53	455.34	
6.3mm Fully Insulated Yellow Female Disconnect Lug	10	45.53	455.34	902,187.30
Hardware - Mobile application				
Smartphone	1	30,000	30,000	30,000
Training requirements fees				
Employee wages (Rs.4500/Day) x 2 Days	5	9,000	45,000	45,000
Total cost				994,887.30

Budget needed (Stage wise)

Initial stage

Hardware Prototype - Rs. 17,700.00

Hardware Mobile application - Rs. 30,000.00

Total - Rs. 47,700.00

Finale stage

Hardware - Finished Product - Rs. 902,187.30

Training requirements fees - Rs. 45,000.00

Total	- Rs. 947,187.30
Total Budget needed	- Rs. 994,887.30

RISK MANAGEMENT

1. compatibility Issues

   There is a risk of encountering compatibility issues between the existing infrastructure and the new electronic controllers, which could lead to integration challenges, delays in implementation, and increased project costs.

2. Technical Challenges

   Implementation may face technical challenges such as software bugs, hardware malfunctions, or connectivity issues, resulting in system downtime, performance degradation, or operational disruptions.

3. Data Security and Privacy

   The handling of sensitive data related to water tank systems and operations introduces the risk of data breaches, unauthorized access, or privacy violations, which could compromise confidential information and undermine trust in the system.

4. Vendor Reliability

   Dependency on external vendors for the procurement of electronic controllers introduces the risk of vendor-related issues such as delays in delivery, quality concerns, or unexpected changes in specifications.

5. User Acceptance and Training

   Resistance from users accustomed to traditional panel boards may hinder adoption of the new electronic controllers, leading to issues with user acceptance and efficiency. Inadequate training or communication could exacerbate this risk.

BENEFITS

1. Enhance controllability (More Controllable Parameters)

   The transition to electronic controllers expands the system's control capabilities, allowing for precise management of various parameters like valve position, Motor status, water level with time. This precision enhances system performance and adaptability to changing needs.

2. Lower weight and size (Reduced Size and Weight)

   Electronic controllers offer a compact and lightweight alternative to traditional panel boards, saving space and simplifying installation and maintenance processes.

3. More Flexibility (Easy to accommodate changes)

   Electronic controllers provide flexibility to adjust to evolving requirements by enabling easy reconfiguration and expansion. This versatility ensures the system remains adaptable and effective over time.

4. Lower Running cost (lower energy consumption and maintenance requirements)

   Electronic controllers are more energy-efficient and require less maintenance compared to traditional systems, resulting in significant cost savings over time. This lowers utility bills and reduces downtime and repair expenses.

STAKEHOLDER ENGAGEMENT

RACI Chart

R - Responsible	Completes the deliverable or task.
A - Accountable	Makes final decisions and signs off on task completion. Only 1 per task.
C - Consulted	An advisor, stakeholder, or subject matter expert who offers guidance before an action is taken.
I - Informed	Kept up to date on decisions made.

Role A	Mr. Dulan De Silva, Mr. J.C.B. Kehelwatta
Role B	Mr. Janaka Ranasinghe
Role C	Eng. Milan Harsha Kumara
Role D	Michelin Lanka (Pvt) Ltd.

Plant Pals Landing Page	Role A	Role B	Role C	Role D
Assessment and Planning	R		C	I
Procurement	R		C	I
Installation and Integration	R	A	C	I
Interface Development	R		C	I
Training and Documentation	R		C	R
Quality Assurance and Monitoring	I		A	R

SUSTAINABILITY AND FUTURE CONSIDERATIONS

1. Environmental impact

   Electronic controllers minimize resource waste and energy consumption, aligning with our commitment to environmental sustainability.

2. Economic viability

   Transitioning to electronic controllers offers long-term cost savings through reduced operating expenses and enhanced scalability.

3. Social benefits

   Improved user experience and safety accompany the adoption of electronic controllers, contributing to public well-being.

4. Future readiness

   Continuous innovation and stakeholder collaboration will drive ongoing improvements and adaptation to emerging needs and challenges.

CONCLUSION

Replacing manual electrical controller with automatic electronic controller for water tank management represents a significant advancement in energy efficiency, sustainability, and resilience. Adapting to modern technology leads to optimizing resource utilization and reducing operating costs. Our commitment to environmental sustainability, economic viability, and social impact represents our dedication to creating a sustainable future for our organization and the communities we serve. With a focus on innovation, collaboration, and continuous improvement, we are poised to unlock new opportunities and drive positive change in every aspect. Together, we embark on this journey towards a more efficient, sustainable, and resilient future.

ACCEPTANCE OF PROPOSAL

AUTHORIZED CLIENT SIGNATURE		DATE OF ACCEPTANCE	