openSAP

TOUCH IOT
WITH SAP LEONARDO

PROTOTYPE CHALLENGE

CONNECTED IRRIGATION SYSTEM

Story

Overview

Irrigation system in India is supported by open wells and bore wells on farmlands which is based on groundwater level. Water is pumped up using centrifugal pumps (in open well) or submersible pumps (in bore well). Fields are still widely irrigated using flood-water method with piping across various crops on the farm. Most of the farmers' day is spent on running after:

1. Checking the moister level at particular crop site
2. Changing the piping (open/close valve) if particular crop got enough moister
3. Visiting the wells to ensure that water pumps are not overheated or there isn't any drop in water flow – both of these can lead to burning up of water pumps

Above activities can easily eat up 2 – 3 days of farmers on a modest farm size of 20 acres in a week, after which another round of water supply is needed – that too without perfect moister in the soil. Frequent monitoring of the equipment (water pumps) health is also imperative, lest overheating of pumps or sudden drop in water level/flow can burn up it up. In those situation, not only the crops are deprived of water when its utmost necessary, but farmer often need to travel to nearest town to get that pump repaired – that frequently takes 2-3 days making big holes in humble farmers pocket.

The whole process need farmers' time and energy more in **'running the system'** than **'improving crop productivity'**.

Internet of Things Solution -- Connected Irrigation system

Connected Irrigation system, is a cloud base IoT solution that is designed to optimize irrigation system with ability to:

1. Track real-time moister level in fields
2. Track water flow through pumps
3. Equipment health by tracking temperature of the pump
4. Provides ability to open/close valves to fields without need to manually open/close them

The solution tracks sensor data from multiple sensors across the different crop areas on the farm. Based on the mapping between valves and moister sensor from that field – a valve is opened where ardent need of water is reported. This avoid manual need to go to the site, check moister and manually open/close valve. A cloud based UI is also enabled for manual intervention and manually open/close valves – but all at button click.

For equipment health, important KPIs from pump i.e. water flow and temperature is tracked in real-time. The pump is switched off based on these parameters. E.g. if threshold temperature for pump is 158 °F, the pump is switched when temperature rises above the level. Similarly, water flow is tracked hourly basis and pump is switched off if water flow level drops below optimal pump efficiency requirement. This ensure that pump's health is continually monitored and avoid from burning up.

This will lead to optimal utilization of water, farmer's time & energy to focus on **increasing the yield of crops and vegetables than purely operating the system**. The solution works on the algorithm which makes decision based on moister data from sensors, valves, pumps and fields map loaded in the system, but also provides UI to override decision matrix in the system – at a button click.

Persona

	Vikas Jadhav "I like to ensure all areas of my farmland are irrigated properly when groundwater level is available, equipment are in fine health and there is no scope of any unplanned maintenance work"
	About: - 36, married, supports 3 members (wife and 2 pre-teen kids) - Based in Marathwada region of Maharashtra known for acute water shortages - Grown up in a farmers family and survives on his 20 acres of agriculture land for living - Daily activity involves multiple rounds of 20 acres of land for crop care and irrigation

Responsibilities	**Main Goals**
• I start my day with a walk across farmland • Look for the areas which need to be irrigated in a day or two and ensure that it happens • Check the water pumps situated on open wells every 2 hours to ensure fine health • Check crops across the farmland to ensure they are free of pests/fungus/viruses and gets required nutrients • Look for increasing productivity of crops	• Open wells being the only source of water, I want to quickly irrigate fields before drop in water flow • Use the water source to irrigate different crop fields on the farm • Avoid burning up of motor pumps due to reduced water flow or overheating • Take care of crops to increase the productivity
Needs	**Pain Points**
• Ability to smartly control the water flow across the farmland • Ability to switch on/off the motor pumps without manual intervention • Ability to stop irrigating farmland when soil got enough moister • Ability to run the water supply overnight without worrying about pump burn up in case of sudden drop in water flow or overheating	• Lots of time required to continually track the moister level at site, because excessive moister can result in crop catching fungus. Huge time is wasted in this activity. • Time & energy consuming regular visit to water pump is needed to ensure it won't burn up by overheating or insufficient water flow • Huge cost and time involved - besides depriving crops of water - in repairing the pumps which otherwise could have invested in providing proper nutrition to crops • More time is wasted in running the system than looking options to increase productivity by better care of crops

Point of View (PoV)

As a farmer

I need a way to understand when crops got enough moister and if all equipment are in best of health,

So that I can optimally use water, avoid unwanted maintenance (cost & time) and invest the time in increasing crop productivity than purely running the system.
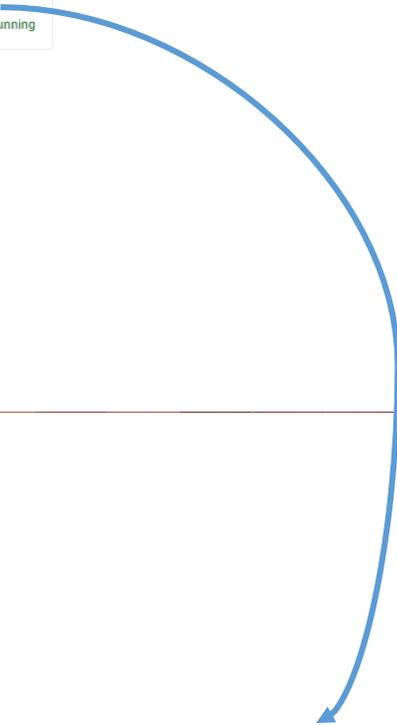
UX Journey

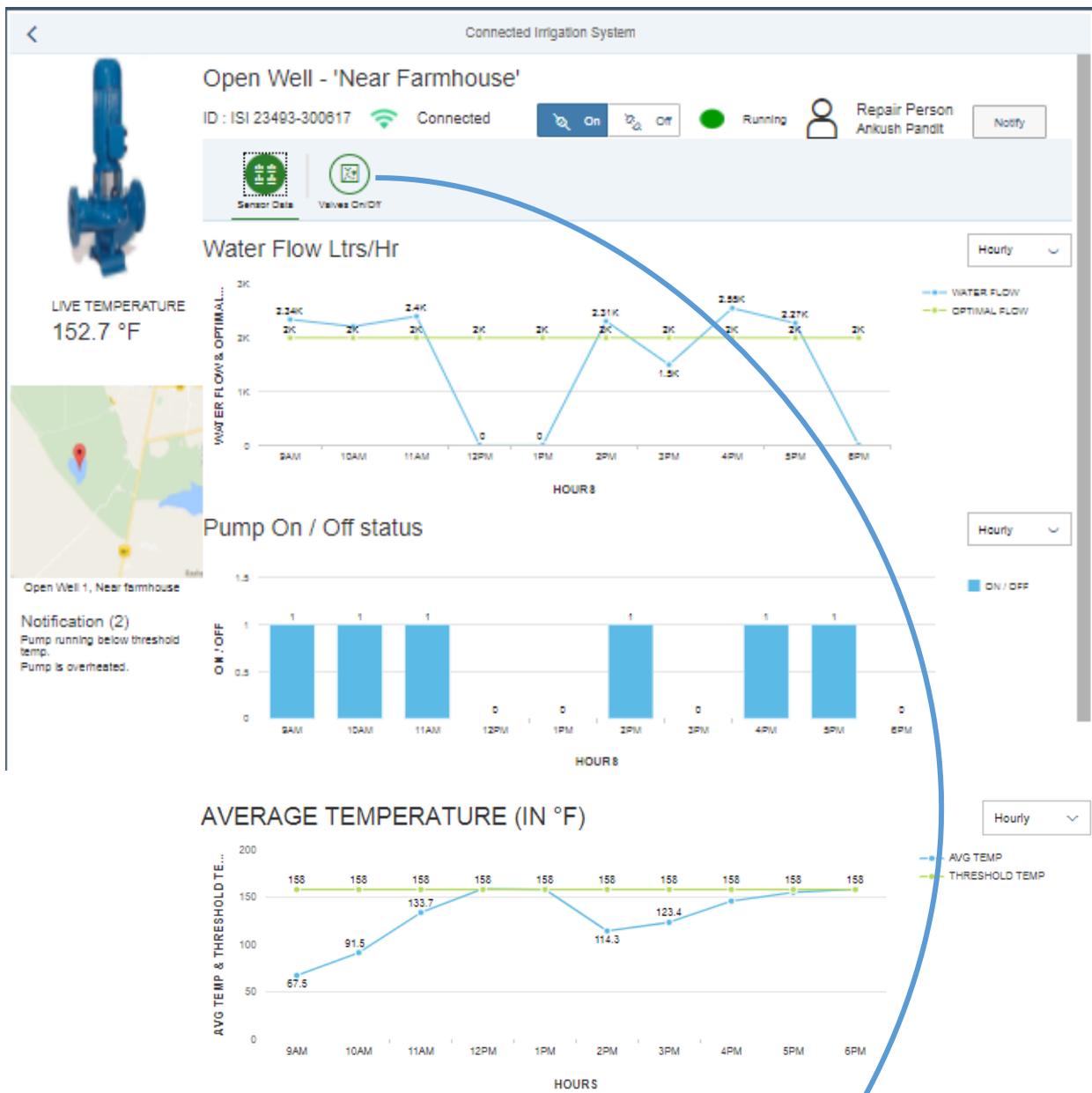|				After 3-4 hrs	Towards the end of day
ACTIONS	1. Start a walk across field	1. Survey soil moister of particular crop (say wheat) at multiple places 2. Repeat the survey for another crop (say maize) field on the farm	1. Go to the open well 2. check water flow at pump 3. if level is ok, start motor 4. check water flow through pipe	**After 3-4 hrs** 1. Check soil moister of the field where water is supplied 2. if enough moister across the crop field, change the valve to redirect the water to another crop field 3. Also visit the motor pump to ensure that it's not overheating and enough water is flowing so it will not run dry and burn up	**Towards the end of day** 1. Check soil moister of the field where water is supplied else need to supply water on next day 2. Visit to water pump to switch it off
MINDSET	-YAAAWWN! I just expect a lighter day today - hope there are less no of rounds across the farm	- Wheat needs water urgently. - Oh! Maize also needs water today..Looks to be a long day	- I hope there is enough water flow to supply to wheat and maize - Flow seems ok, but will it stays for a day at least? - Will the level drop suddenly? Why there is not smart system to auto-off pumps?	-Hmm! Wheat seems in good shape now, but is there enough moister across all areas of wheat? -Ok. All looks good for wheat. I hope water flow doesn't drop till Maize gets done. Don't want to do it next day, else crop will get affected -Is the pump overheating? -Is there enough water flow through the pipe?	- Huuh! I hope Wheat and Maize are good for another 3-4 days, but will the dry and hot sun let go another 3-4 days before next supply? - Don't want to walk to the surprise,,, hope pump is fine..? - I wish someone comes with better system so I can spend more time in taking care of crops than just watering them.
FEELING	☺ / ☹				
TOUCH POINTS	-Walk to the field	-Particular Crop field - Soil	-Motor pump near open well -Pipeline to check flow	-Particular crop field – soil -Motor pump -Piping valve	-Particular crop field – soil -Motor pump

Prototype

Connected Irrigation System

2
NOTIFICATION

CF Pump 1, Open Well

Running

6
NOTIFICATION

Submersible Pump, Bore Well

Under Repair

Open Well - 'Near Farmhouse'

ID : ISI 23493-300617   Connected   On   Off   Running   Repair Person Ankush Pandit   Notify

Sensor Data   Valves On/Off

LIVE TEMPERATURE
152.7 °F

Open Well 1, Near farmhouse

Notification (2)
Pump running below threshold temp.
Pump is overheated.

Water Flow Ltrs/Hr   Hourly

WATER FLOW & OPTIMAL...

2.34K   2K   2.4K   2K   2K   2.31K   2K   2.55K   2.27K   2K
2K   2K   2K   2K   1.5K   2K   0   0

WATER FLOW
OPTIMAL FLOW

9AM 10AM 11AM 12PM 1PM 2PM 2PM 4PM 5PM 6PM
HOURS

Pump On / Off status   Hourly

ON / OFF
ON / OFF

1   1   1   0   0   1   0   1   1   0

9AM 10AM 11AM 12PM 1PM 2PM 3PM 4PM 5PM 6PM
HOURS

AVERAGE TEMPERATURE (IN °F)   Hourly

AVG TEMP & THRESHOLD TE...

158   158   158   158   158   158   158   158   158   158
133.7   123.4
91.5   114.3
67.5

AVG TEMP
THRESHOLD TEMP

9AM 10AM 11AM 12PM 1PM 2PM 3PM 4PM 5PM 6PM
HOURS

- Pump is switched off when there isn't enough flow through the pipe i.e. flow is below optimal value of 2000 Ltr/hr, in above screenshot, its switched off at 3PM owing to below optimal flow of water
- Pump is also switched off when its overheated, in above screenshot its switched-off due to overheat at 12PM, 1PM and 6PM
- On click of 2nd tab i.e. Valve On/Off, a sensor based valve control board opens to individually open/close valve by over-riding in-built algorithm
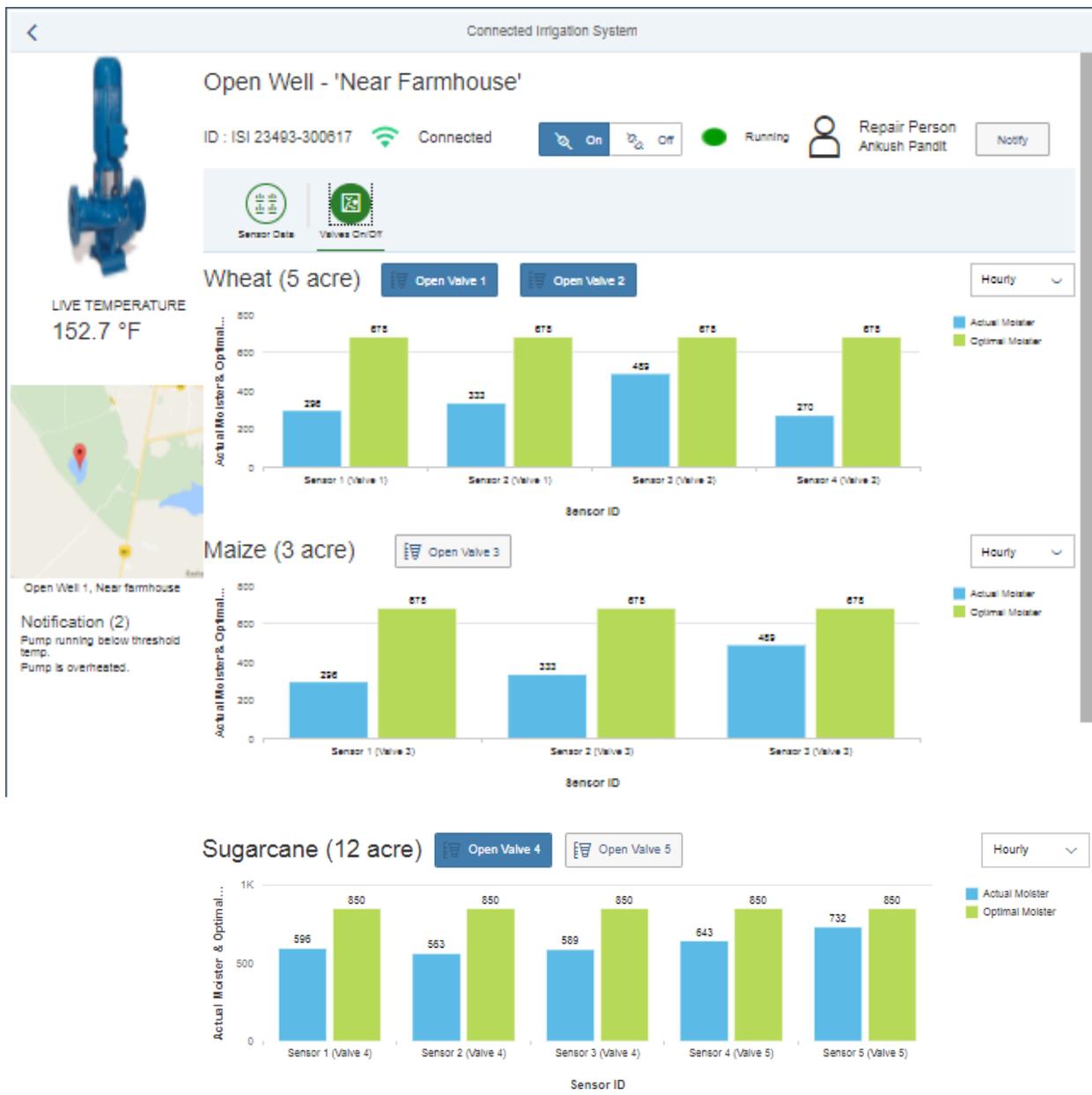
- Crop level details with sensor for moister reading along with corresponding valve gives detail level access to control irrigation to field
- Farmer can choose to open valve where there is below optimal moister e.g. for Sugarcane, **first 3 sensors (1,2 and 3)** controlled by **Valve 4** is opened as only those sensor shown comparatively less moister than **other 2 sensor** controlled by **Valve 5.**

BUILD link to mockup:

https://standard.build.me/prototype-editors/api/public/v1/snapshots/e1829b1549c2384e0e1b514a/artifacts/latest/index.html#/launch_page