

Bin sensors and smart dynamic routing

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Introduction

- What is the problem?
- What do we want to achieve?
- What have we done?
- Has it worked?
- Next steps

What is the problem?

- Regular weekly collection schedules...
- Inefficient collections
- Doesn't cater for seasonal variations
- Poor customer service
- No site specific performance data



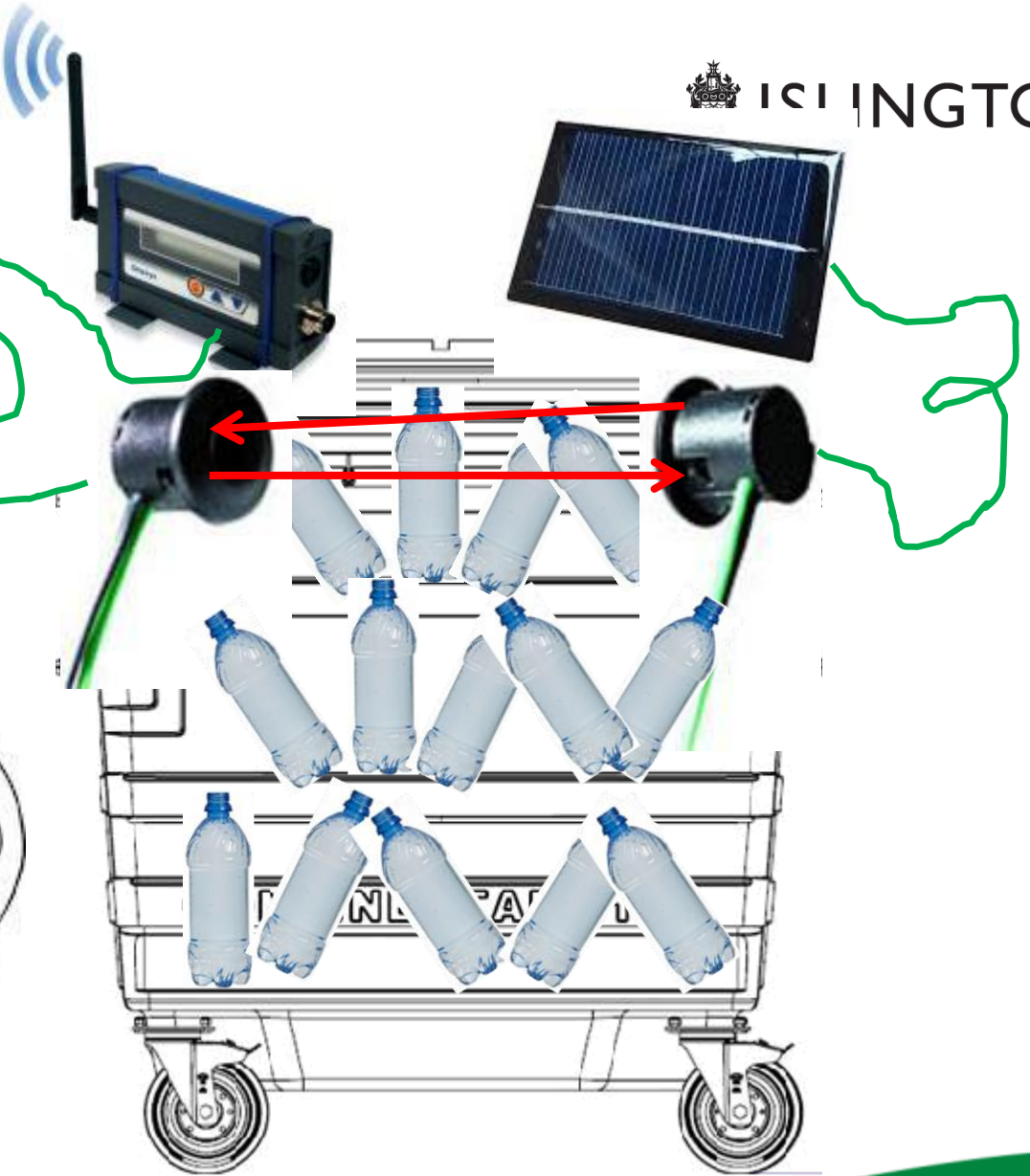
What do we want to achieve?

Three key objectives:

- **Efficient collections** – only empty bin when the bin needs emptying with the most efficient driving route
- **Better customer service** – make sure the bin is emptied before it overflows
- **Performance data** – volume based data showing how well a site is performing, and whether collections are being made effectively



Lets put sensors in the recycling bins!



What have we done?

Enevo trial

- In built battery, no power supply needed
- Measures volumetric fill level
- Hourly data
- Feeds back to Enevo database
- Predicts when full
- Creates 'smart plans' for collections



What have we done?

Enevo trial

- Sensors fitted to all euro bins on a collection, not including 'cold collections':
 - Commercial collections
 - Concierge managed collections
- 420 containers
- Approximately 60% of total round
- Some sites have restrictions
 - Schools
 - Other sites with limited access
- Entire round now run on 'smart plans'

What have we done?

Smart Plans

- System predicts when bins will be full from historical data
- Provides alerts when bins are
 - Full
 - Not been emptied
 - Tipped over
 - On fire
- Generates an optimised collection routes ('Smart Plan')

Enevo dashboard

- Please contact supplier for a demonstration.

Has it worked?

Efficient collections

- All sites used to be emptied AT LEAST once a week.
- 70 sites predicted to be full in MORE THAN seven days time
- Productivity measures (kg collected per hour) don't yet show a significant improvement

Example site

Has it worked?

Example site

- 5 containers, previously emptied **once per week**
- Fills up **every 15 days** on average
- Could reduce number of bins and reallocate them elsewhere

Example site

Has it worked?

Example site

- 1 container previously emptied **once per week**
- Fills up **every 4 days** on average
- Add bin (if space) to reduce frequency

Has it worked?

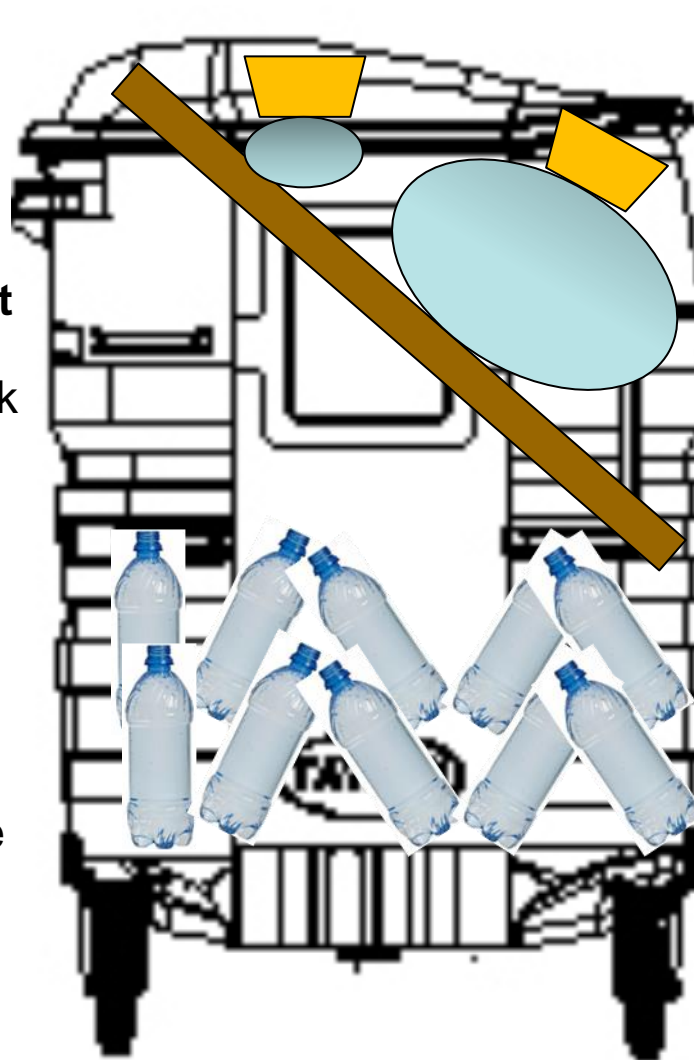
Better customer service

- Sites should get emptied before they're full, but not fool proof
- Crew has limited time in the day
- A few sensor installation glitches
- Sensor position

Has it worked?

Sensor position important

- Cardboard can create voids spaces at the back of the bin
- For the resident, the bin is full
- Sensors reads partially full
- Collection doesn't get triggered
- Adjustments to algorithms to over come



Has it worked?

Better customer service

- Sites should get emptied before they're full, but not fool proof
- Crew has limited time in the day
- A few sensor installation glitches
- Sensor position
- Fill rate can be unpredictable, especially schools

Has it worked?



Large amount of waste produced suddenly



No waste generated during holidays

Has it worked?

Performance data

- Great data via dashboard
- Vary bin numbers to 'equal out' fill frequencies
- Frequent collection restricts the smart plans
- We know if a crew have emptied a bin
- We can monitor the impact of communications and promotions
- We could use for comparative performance between sites

Has it worked?

Smart Plans

- Big change in crew culture
- Some routes look 'odd', but large number of cold collections is a restriction
- Improvements to system to allow reporting of contaminated bins

Next steps

- Further evaluation of productivity
 - Bins ARE mostly full when emptied, so SHOULD be more productive
- System improvements
 - Change position of sensors
 - ‘In-route recalculation’
 - Better, easier crew reporting of site issues and contamination
 - Improved prediction of when bins will fill
 - Further refinement of algorithms
- Trial a waste round (communal estate bins etc)

Meet our crew...



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