

Waste checker

Empowering households to reduce energy waste by making data science end-user friendly



Dr. Stephen J. Galsworthy
Head of Data Science - Quby

TOON

Energy waste

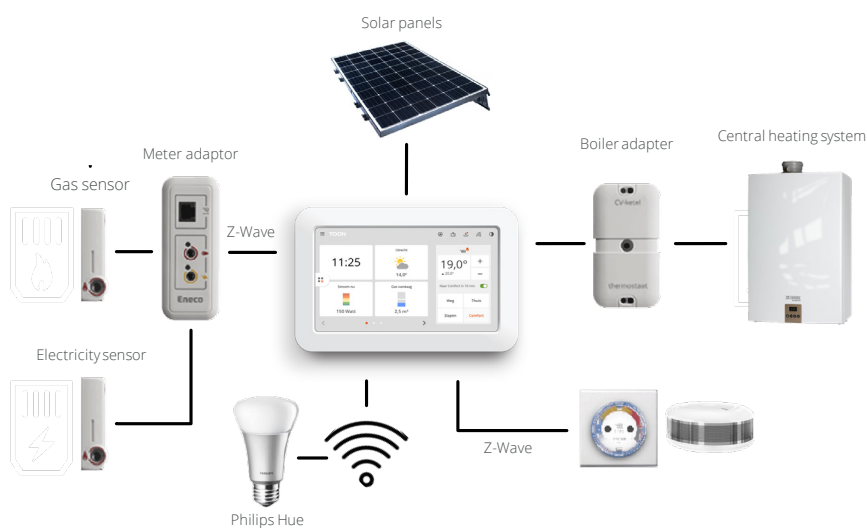
Though energy waste is largely invisible to the average citizen, it is a big problem for our planet. The global consumption of energy is the driver of this issue: consumption exceeds sustainable production. This drives energy companies to extract more resources at an uncertain cost. In the Netherlands we see the effect of this phenomenon up close as the city of Groningen is literally shaking because of the overextraction of natural gas.

At Quby we use data science to make daily lives in Dutch households easier and more sustainable by giving insight into energy usage and now also; energy waste.

About Quby and Toon

Quby is the creator and provider of the smart thermostat and energy display Toon that took the Dutch market by storm. With an installed base of over 300,000 connected home energy platforms in the Netherlands alone, Toon collects a large amount of data, from an abundance of sources: electricity and gas meters, solar panels, smart plugs and boilers.

Our passionate, diverse and international team shares one focus: delivering a great product. Together, we work hard to create smarter solutions for homes and offices across Europe. We believe in changing the energy industry from supply oriented to a service oriented industry that helps people handle every-day challenges. Toon is more than a smart thermostat. By thinking outside of the box our teams are developing options for security, assisted living, comfort and sustainability. Our teams use Agile and SCRUM to remain flexible in a fast-paced and changing sector.



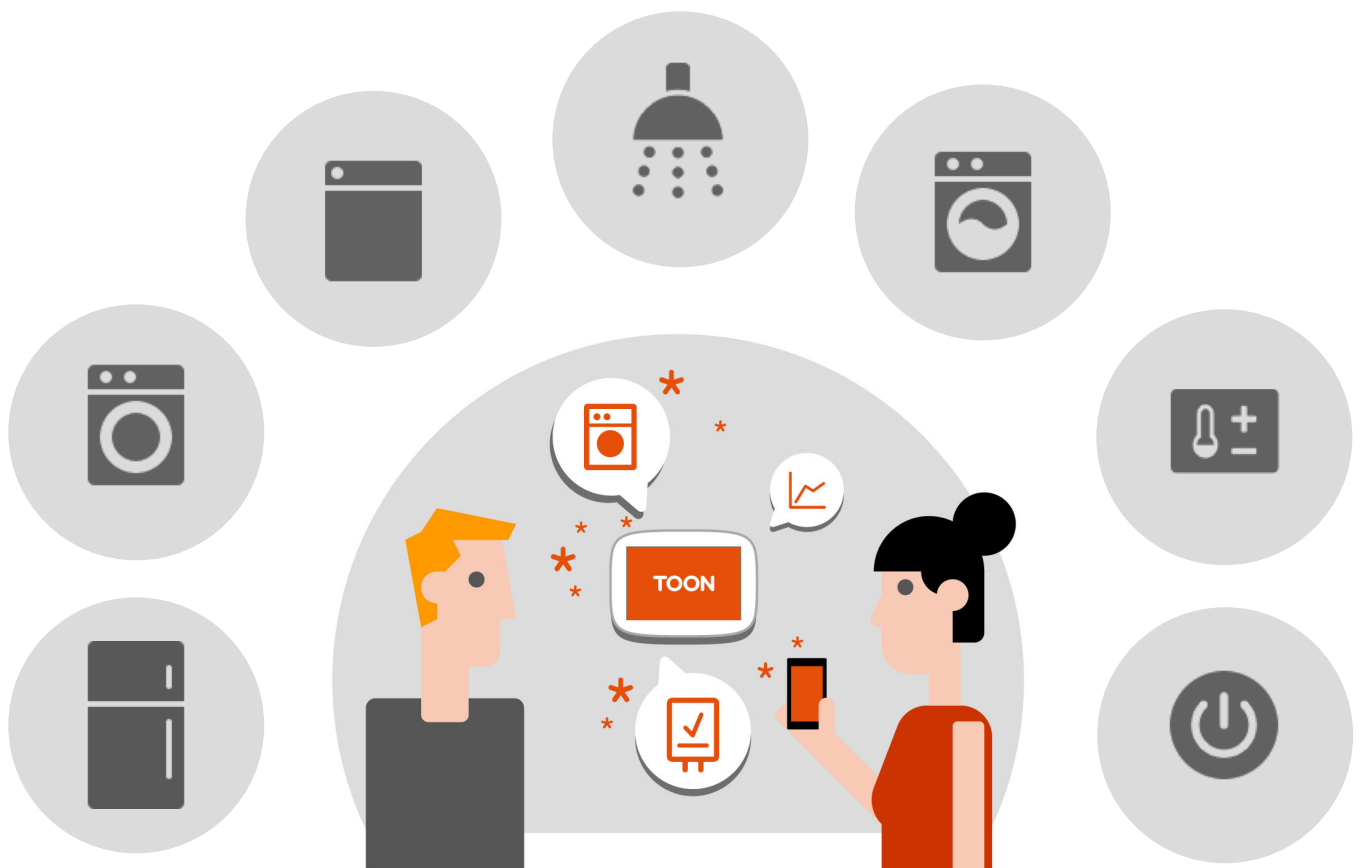
TOON

About Waste checker

Until now, Toon allowed users to see how their electricity and gas usage stack up. As a homeowner it was still difficult to determine the exact causes of energy waste at home or what to do about it.

That's why we introduced the Waste checker as an additional, data science based service in our Toon app. Our users get to know the energy usage of appliances in their homes, hunt down the power guzzlers and stop the waste. Using data from the Toon platform, we are able to give detailed insight into the energy waste on an individual appliance level. Based on these individual analyses, the app offers personalised advice on how to avoid wasting energy. By showing the benefits of reducing energy waste, we empower households to stop wasting energy - saving customers money and taking another step towards preserving the planet.

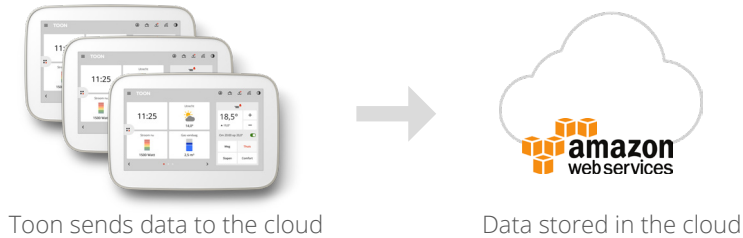
We target the big power guzzlers in the homes of our users. But Waste checker is not limited to electricity. It currently consists of 7 unique use cases: refrigerator, dryer, dishwasher, shower head, washing machine, thermostat and standby usage (sluipverbruik). Waste checker keeps getting smarter: our developers are adding new cases, devices and behavioural suggestions continuously.



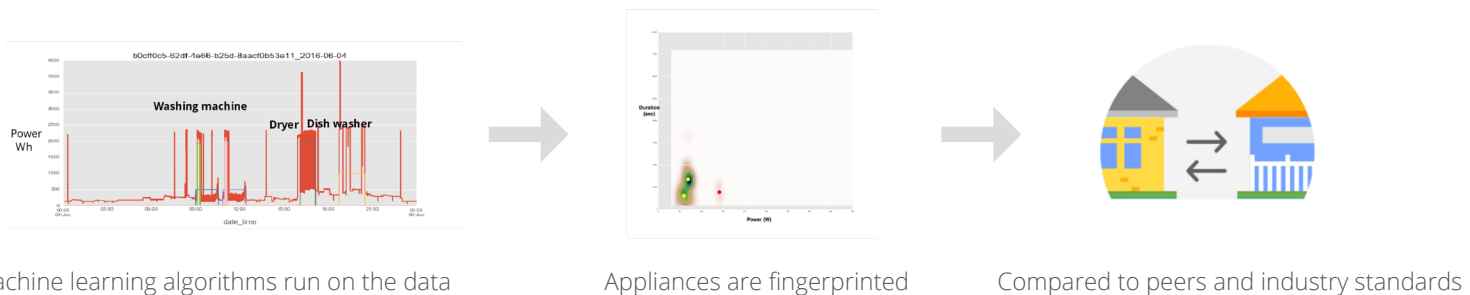
TOON

How does it work?

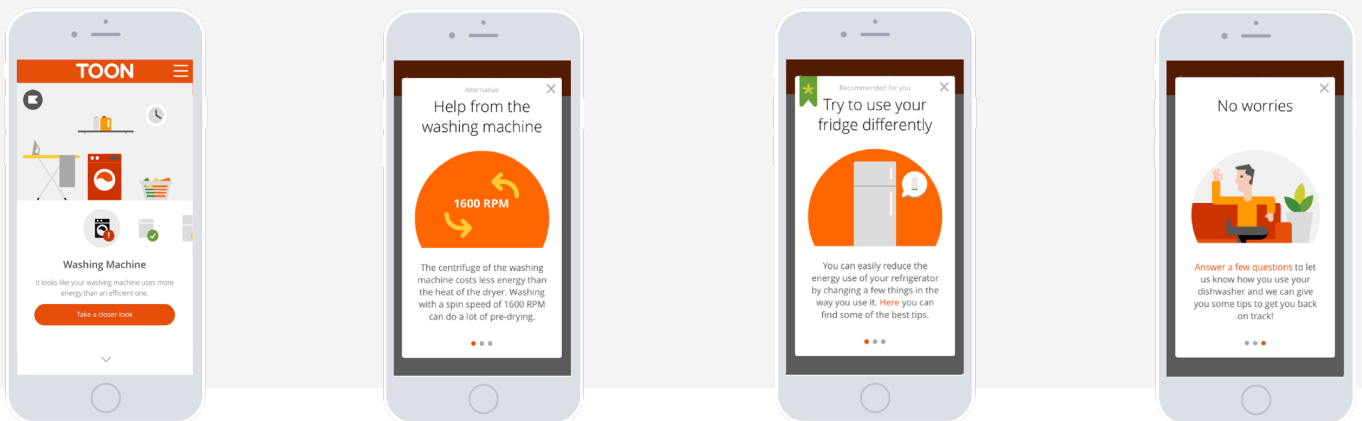
Each individual Toon sends data anonymously to the Quby data collector, which then gathers the data and sends it to the cloud where it is stored in Amazon Web Services. The analysis is done in the data science platform Databricks. From here, the data can be processed using novel (patent pending) machine learning algorithms developed in-house by the data scientists at Quby.



The algorithms analyse the electricity, gas, boiler and thermostat data from homes to distinguish appliances from each other and to determine the 'fingerprint' of each appliance. The fingerprint identifies an appliance and describes its usage pattern. The fingerprint is compared with industry energy consumption standards such as EU efficiency labels and behaviours from over 300,000 peers. This comparison then provides feedback to the user about the efficiency of their appliance and their behaviour.



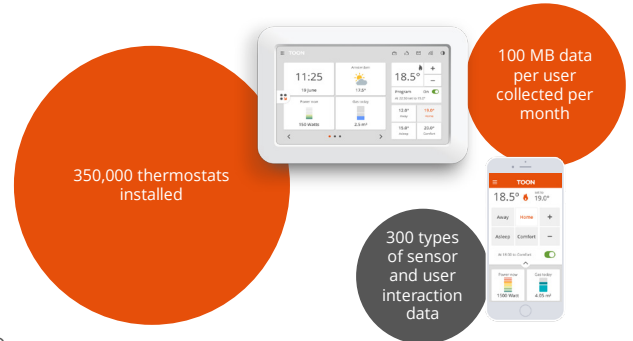
Finally, this is translated to personalised, end-user friendly advice shown in the Toon app. The app uses input given during the set-up and the data received from Toon.



TOON

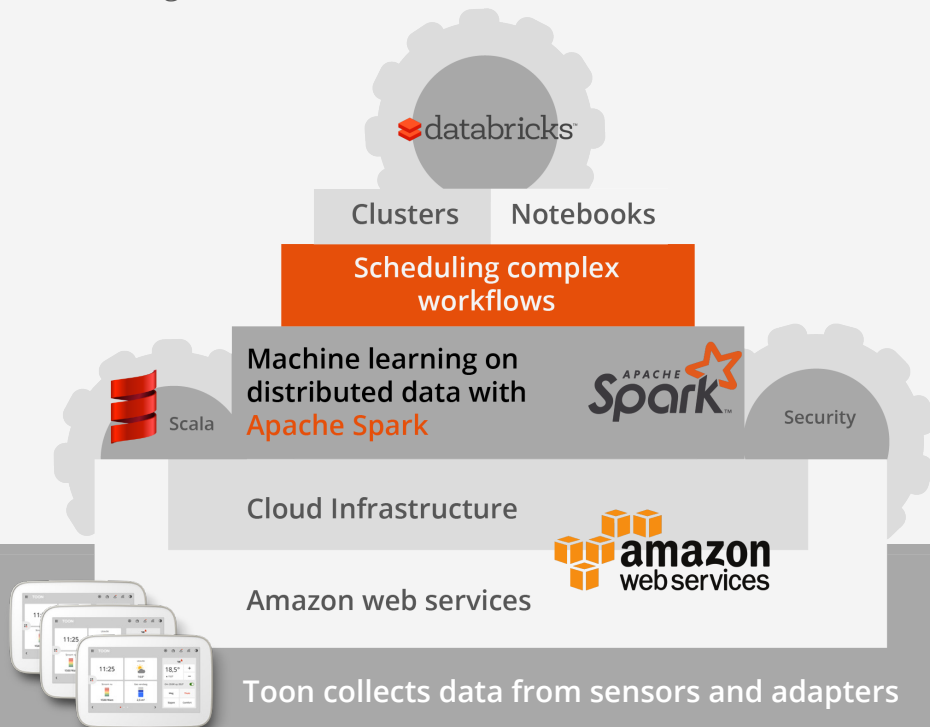
Waste checker stats and facts

- This is data science at **scale**. For the dishwasher, each day we detect over 100,000 dishwasher cycles. That's 17 years of dishwashers running continuously. 40% are used inefficiently.
- Toon is able to collect over **300 types of sensor and user interaction data**, in total providing over 700 TB worth of data.
- In addition to saving energy, Waste checker allows scientists to validate or invalidate **assumptions about energy usage** on an unprecedented scale. This has already led to some unexpected findings. Water sourcing, from either surface or groundwater, can impact energy use and cost in the winter. Since surface water cools down in the winter, it takes dishwashers and washing machines more time and up to 21% more energy to heat the water up.



Data Science Platform

Underneath the hood, the Waste checker utilizes state of the art big data technology. We use the cutting edge functionality of Apache Spark to perform machine learning at scale on distributed data and the Databricks Unified Analytics Platform as our data science platform for managing clusters and notebooks and for scheduling the complex workflows. In total we've analyzed hundreds of terabytes of data to bring this service to Toon users.



TOON