# Understanding consumer usage to design new products and the right recommendations of use – example: energy of dishwashing in Australia [*]

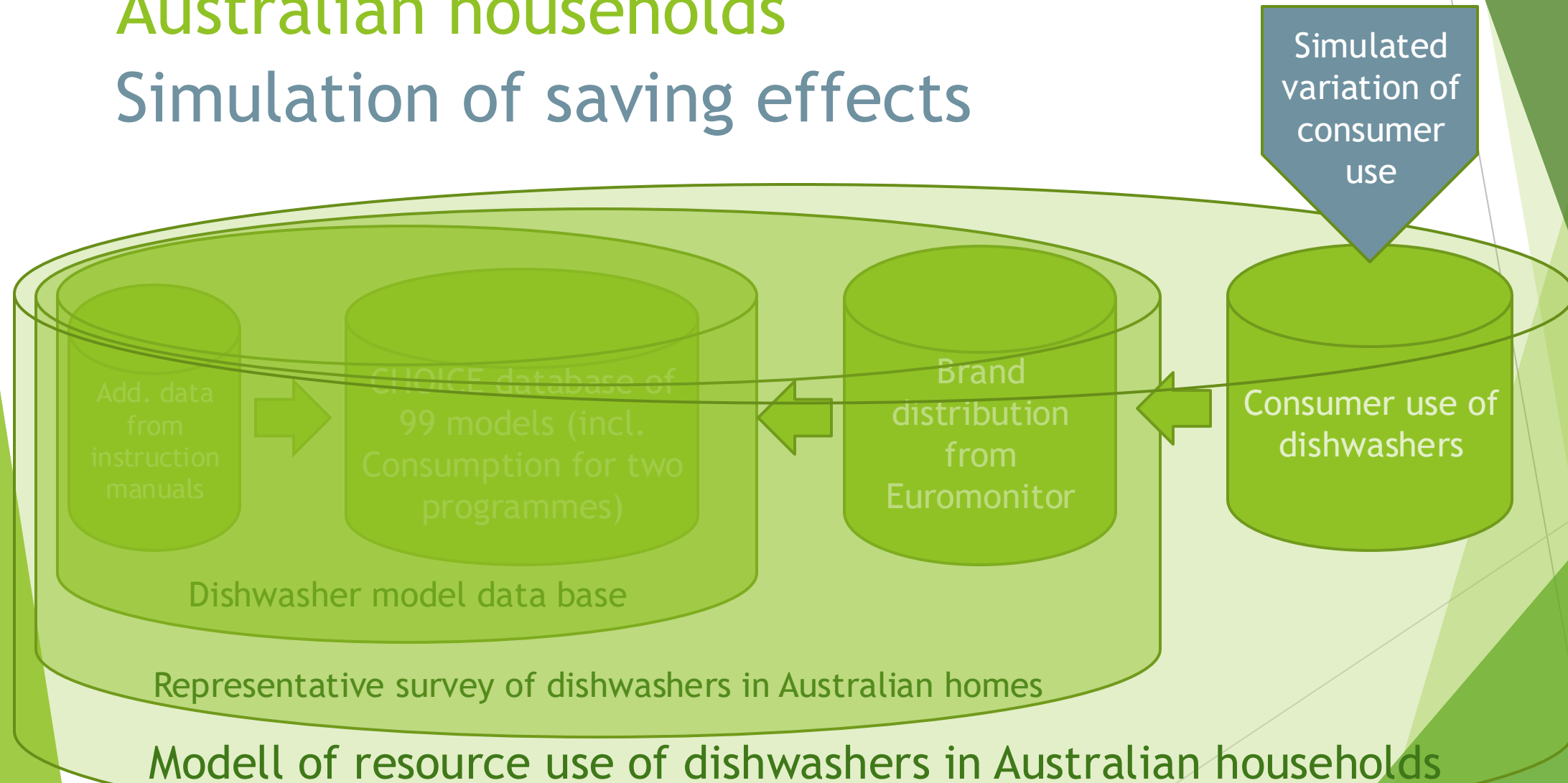*Thomas Alt [1], Rainer Stamminger [2]*

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[*] This is an extract of a full paper submitted to *Energy Efficiency* for publication.

# Modelling resource use of dishwashers in Australian households
## Simulation of saving effects

Simulated variation of consumer use

Add. data from instruction manuals

CHOICE database of 99 models (incl. Consumption for two programmes)

Brand distribution from Euromonitor

Consumer use of dishwashers

Dishwasher model data base

Representative survey of dishwashers in Australian homes

Modell of resource use of dishwashers in Australian households

# Installed base of dishwashers in Australia
## according to sold dishwashers for the years 2015-2020

| Company | Sales units | |
| --- | --- | --- |
| | sum 2015-2020 | relevant market share |
| BSH Hausgeräte GmbH | 785.5 | 23.1% |
| Haier Group | 651.9 | 19.2% |
| Miele & Cie KG | 463.6 | 13.6% |
| Electrolux AB | 368.3 | 10.8% |
| LG Corp | 239.5 | 7.1% |
| Hisense Group | 191.5 | 5.6% |
| Shriro Group, The | 120.6 | 3.6% |
| Arçelik AS | 110.3 | 3.2% |
| EGO Blanc & Fischer & Co GmbH | 77.6 | 2.3% |
| SMEG SpA | 73.9 | 2.2% |
| Electrolux AB | 51.6 | 1.5% |
| De'Longhi SpA | 49.3 | 1.5% |
| Glen Dimplex Group | 43.4 | 1.3% |
| Haier Group | 34.3 | 1.0% |
| Electrolux AB | 30.6 | 0.9% |
| Inter Ikea Systems BV | 17.5 | 0.5% |
| Midea Group Co Ltd | 9.3 | 0.3% |
| Whirlpool Corp | 18.0 | 0.5% |
| Samsung Corp | 53.6 | 1.6% |
| Whirlpool Corp | 6.2 | 0.2% |
| Total | 3,396.5 | 100.0% |

based on Euromonitor data_5.11.20220

# CHOICE model database

▶ Based on 99 tested dishwasher models of the last years

▶ Data for tested programme + officially declared data for (other) programmes (Energy Star - CHOICE)

▶ Additional data for, in total, seven programmes from mainly instruction manual (in total 980 data sets)

- Normal/ regular/ everyday
- Eco
- Quick/ fast low temperature
- Quick/ fast high temperature
- Auto/ sensor
- Intensive/ pots & pans/ heavy
- Gentle/ delicate/ glass care

▶ Data needed for programme modifier (from Stiftung Warentest average for ,express...', F&P private communication): only modifier **Express / speed / quick / time saving** included in model

- **Express / speed / quick / time saving**
- Half load
- Hygiene
- Intensive
- Extra dry

# Effect of using the modifier 'express/speed/quick/time-saving' on the consumption of water and energy and the programme duration of various automatic dishwashers

Data tested and published by Stiftung Warentest (test 06/2016, 07/2017, 11/2018, 10/2019)

| Effect of modifier 'express/speed/quick/time-saving' | Energy in kWh | Water in litres | Duration in h:min |
|---|---|---|---|
| Average eco programme | 0.87 | 9.7 | 3:40 |
| Average eco programme + modifier 'express/…' | 1.25 | 12.1 | 1:34 |
| Change in % | 44 | 25 | -57 |

# Market research on consumer behaviour in use of the dishwasher

*Target*: get **representative** details of the use of dishwashers in Australia

Ask only persons which are **substantially** involved in doing the dishes in the dishwasher

*Questions:*

▶ Which dishwashers are in use (brand and sub-brand)?

▶ Which programmes are used and how often?

▶ How long run the dishwasher programme on average?

▶ Which programme modifiers are used (e.g. short)?

▶ How soiled are the dishes loaded in each programme?

▶ Are dishes pre-rinsed?

▶ How old is the dishwasher?

# Representative consumer survey on 3 000 consumers with and without a dishwasher

## Cross quota Australia:
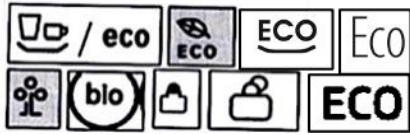## household size vs. age of lead member of hh

Source: undata (http://data.un.org/Data.aspx?d=POP&f=tableCode:50) *own calculation*

| Australia | Age Group | | | |
|---|---|---|---|---|
| Household size | between 20 and 39 years | between 40 and 59 years | between 60 and 74 years | total |
| 1 person HH | 5% | 8% | 8% | 21% |
| 2 person HH | 10% | 10% | 12% | 32% |
| 3 person HH | 6% | 8% | 3% | 17% |
| 4 person HH | 6% | 10% | 1% | 18% |
| > 4 person HH | 4% | 7% | 1% | 11% |
| total | 32% | 43% | 24% | 100% |

Prorammes generically defined and associated with the usual pictograms, from which they could select which programme they are using and how often per week. Analysing this survey delivers the relative frequency of the programmes used based on the total number of programmes analysed per week. Those consumers where the modifier 'express/speed/quick/time-saving' was available were additionally requested to name the frequency of using this modifier. Consumers were also asked to clearly indicate for each of the programmes (with or without the modifier) how heavy the soiling usually is (light, normal or heavy).

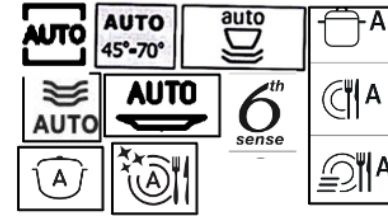# Programme names and usual symbols

- Eco



- Normal / regular / everyday
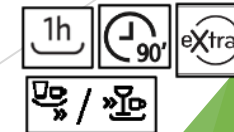


- Intense / pots & pans / heavy



- Auto / sensor



- Gentle / delicate / glasses wash



- Quick / fast / short (45°, Jet, 30', express, …)



- Quick / fast / short (65°, power, plus, …)

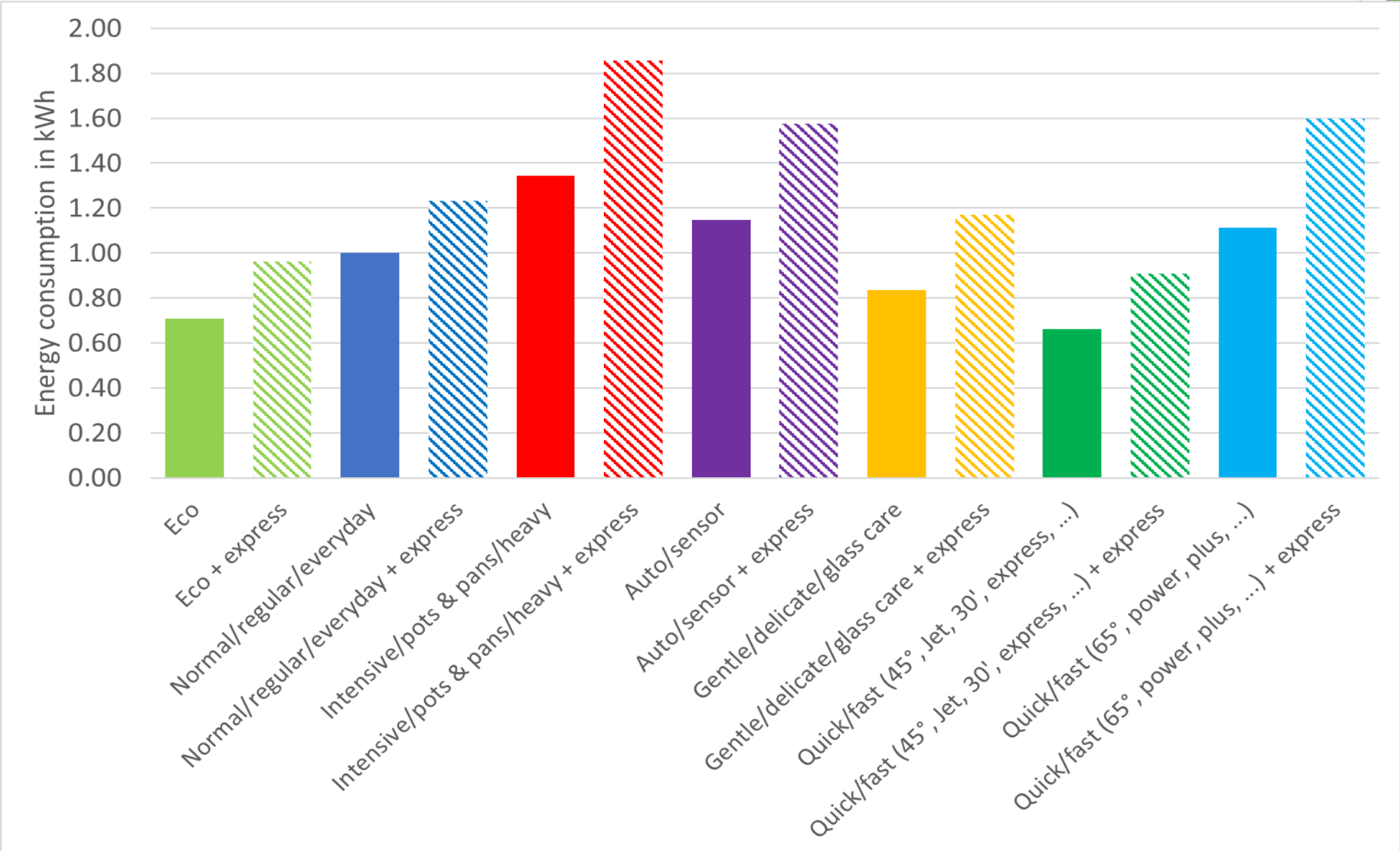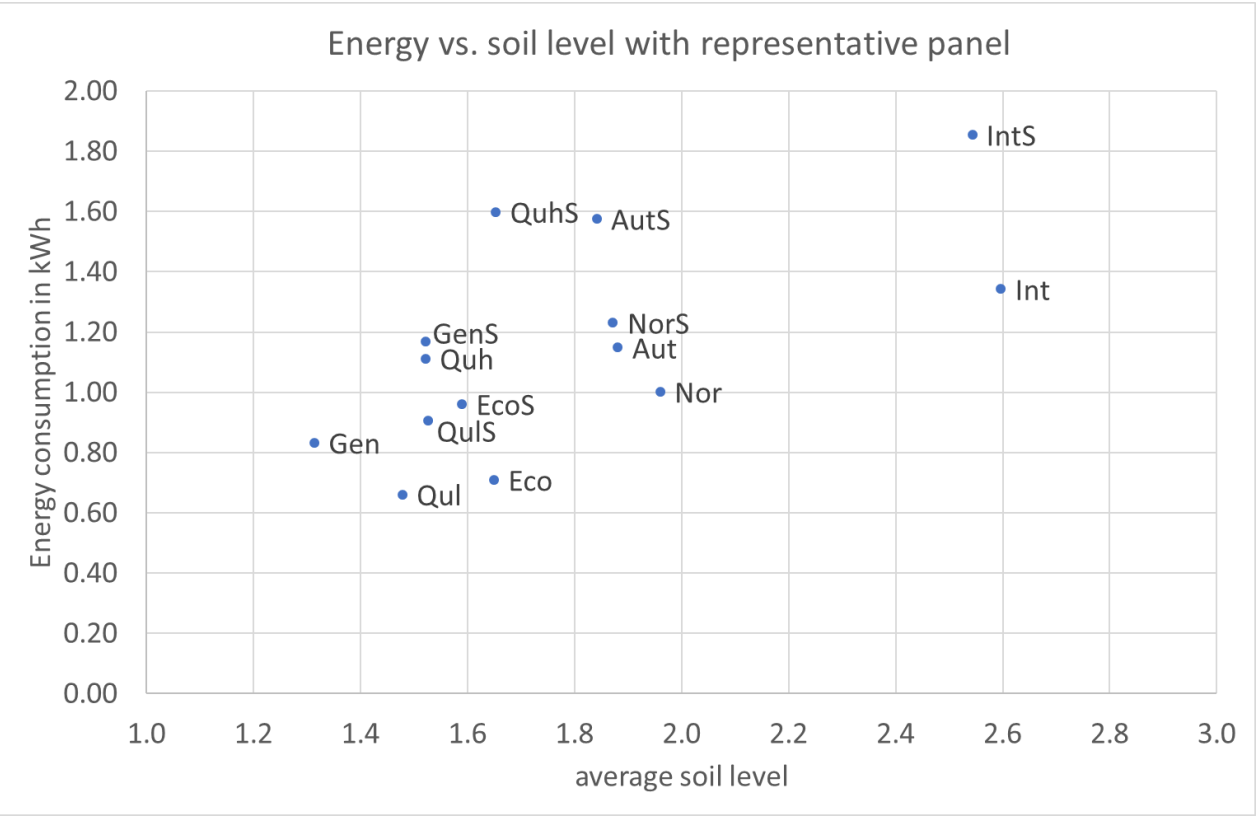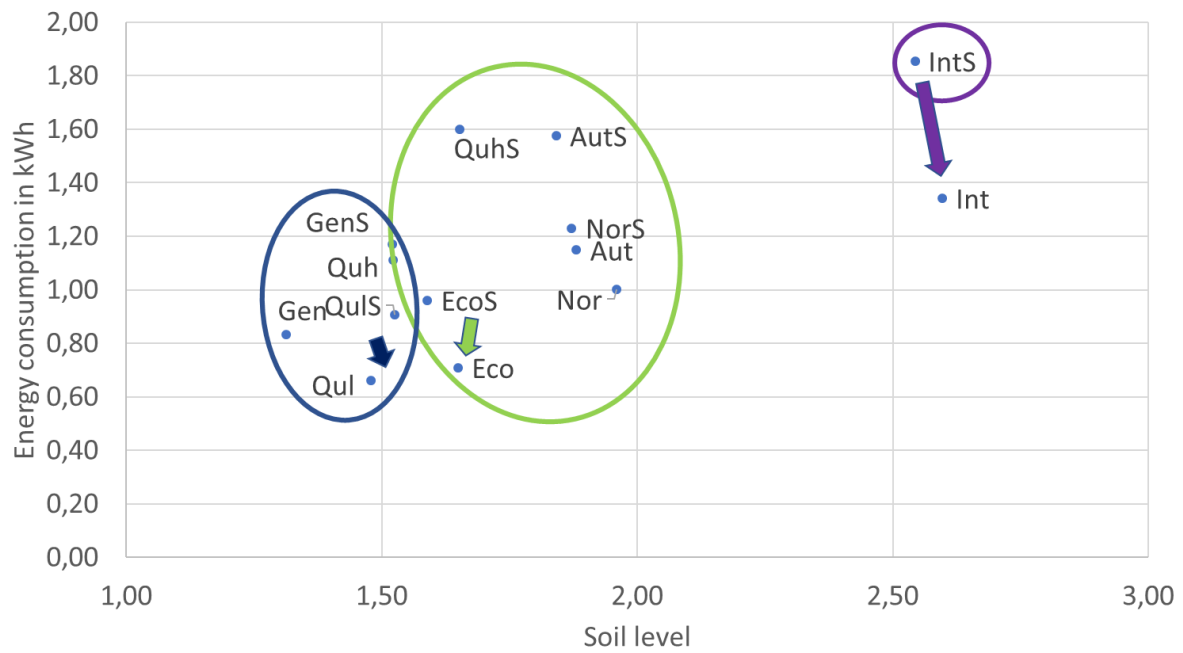| n=4099 cycles per week | rel. frequency of cycles selected |
|---|---|
| Eco | 29,2% |
| Normal/regular/everyday | 38,8% |
| Intensive/pots & pans/heavy | 11,5% |
| Auto/sensor | 5,1% |
| Gentle/delicate/glasses wash | 2,6% |
| Quick/fast (45°, Jet, 30', express, …) | 7,8% |
| Quick/fast (65°, power, plus, …) | 5,1% |
| sum | 100,0% |

# Installed base of dishwasher in Australia + Consumer use

| Programme (plus modifier) | Short | Consumer choice | Energy | Water | Duration |
|---|---|---|---|---|---|
| Eco | Eco | 18,9% | 0,71 | 11,8 | 111 |
| Eco + 'express / speed / quick / time saving' modifier | EcoS | 10,3% | 0,96 | 14,2 | 47 |
| Normal/regular/everyday | Nor | 27,9% | 1,00 | 12,9 | 135 |
| Normal/regular/everyday + 'express / speed / quick / time saving' modifier | NorS | 10,9% | 1,23 | 14,0 | 78 |
| Intensive/pots & pans/heavy | Int | 8,9% | 1,34 | 14,2 | 155 |
| Intensive/pots & pans/heavy + 'express / speed / quick / time saving' modifier | IntS | 2,6% | 1,85 | 17,1 | 78 |
| Auto/sensor | Aut | 3,2% | 1,15 | 14,1 | 146 |
| Auto/sensor + 'express / speed / quick / time saving' modifier | AutS | 1,8% | 1,58 | 17,1 | 74 |
| Gentle/delicate/glasses wash | Gen | 2,0% | 0,83 | 12,1 | 102 |
| Gentle/delicate/glasses wash + 'express / speed / quick / time saving' modifier | GenS | 0,5% | 1,17 | 15,2 | 52 |
| Quick/fast (45°, Jet, 30', express, …) | Qul | 5,5% | 0,66 | 9,2 | 38 |
| Quick/fast (45°, Jet, 30', express, …) + 'express / speed / quick / time saving' modifier | QulS | 2,3% | 0,91 | 11,1 | 22 |
| Quick/fast (65°, power, plus, …) | Quh | 3,7% | 1,11 | 11,7 | 64 |
| Quick/fast (65°, power, plus, …) + 'express / speed / quick / time saving' modifier | QuhS | 1,4% | 1,60 | 14,6 | 27 |
| sum | | 100% | 1,02 | 13,0 | 102 |

# Programmes and their energy consumption (Australian model)

Energy vs. soil level with representative panel
and simulation of possible energy saving strategy

# Recommended programme selection

Implementing these simple rules for programme selection in consumer communication would require that the following messages are conveyed to the consumer:

▶ *Do not use the programme modifier 'express/speed/quick/time-saving' as it may take significant additional resources (energy, water).*

▶ *Use the ECO programme for all normally soiled dish loads and accept the longer programme duration as this will provide a good cleaning with a low amount of resources (energy, water).*

▶ *Use the Quick/fast (45 °C, Jet, 30', express, ...) programme for lightly soiled dishes.*

# Simulation of saving effects of following the recommended programme selection

| Programme orig. | Program re-allocation (simulation) | | | |
|---|---|---|---|---|
| | | Simulated choice | Energy in kWh | Water in litre |
| Eco | | | | |
| EcoS | | | | |
| Nor | | | | |
| NorS | | Eco | 78,2% | 0,71 | 11,80 |
| Aut | | | | |
| AutS | | | | |
| Quh | | | | |
| QuhS | | | | |
| Int | | Intensive/pots & pans/heavy | 11,5% | 1,34 | 14,20 |
| IntS | | | | |
| Qul | | | | |
| QulS | | Quick/fast (45°, Jet, 30', express, …) | 10,3% | 0,66 | 9,20 |
| Gen | | | | |
| GenS | | | | |
| | average | 100,0% | 0,78 | 11,81 |

Average energy and water consumption for the simulated optimised choice consumer behaviour regarding programme selection. Programme name coding: 'Int' = intensive, 'Aut' = automatic/sensor, 'Nor' = normal, 'Gen' = gentle, 'Qul' = quick low temperature, 'Quh' = quick high temperature and 'S' = use of the modifier 'express/speed/quick/time-saving')

Simulation of today (2010) use:
energy: 1,02 kWh  water: 13,0 L per cycle in average

Saving energy → 24 % | 9 % ← Saving water

# Thank you very much

*We are pleased to answer your questions*

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