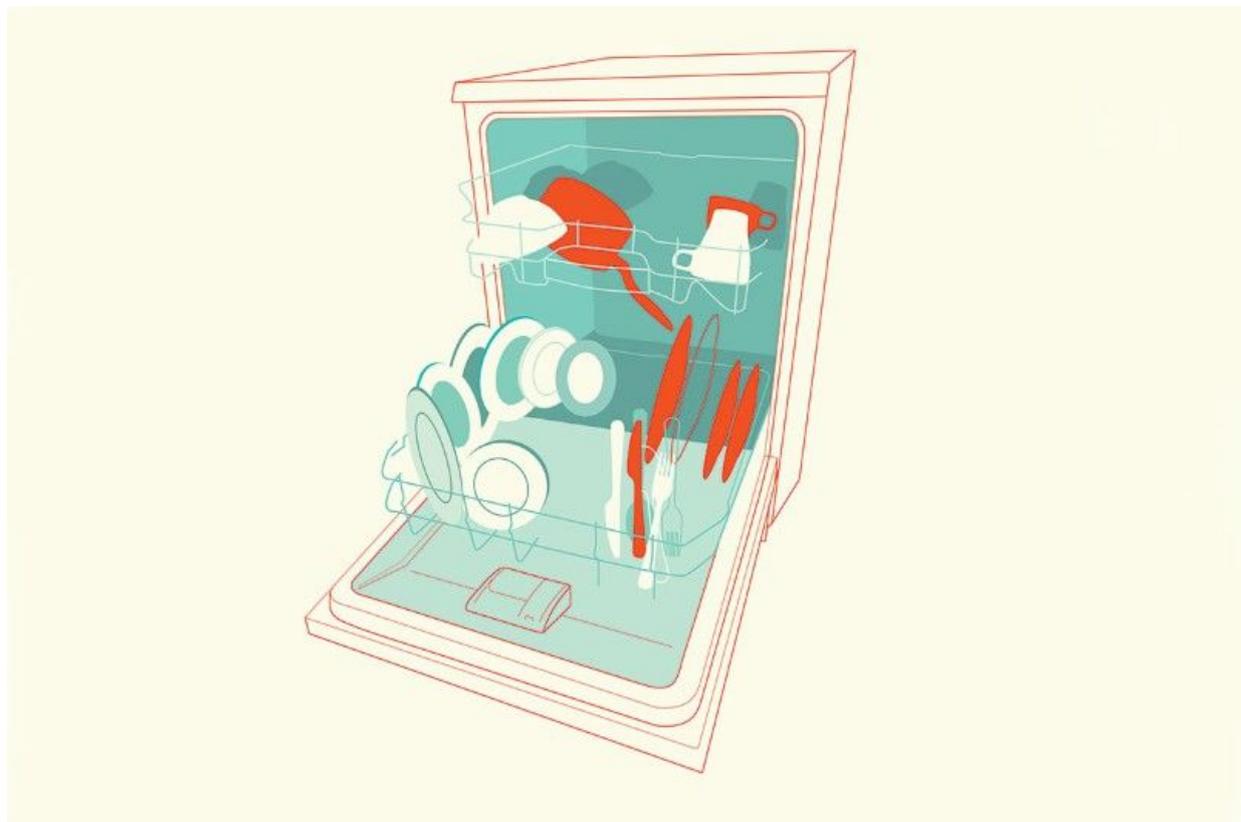


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The ultimate guide to stacking the dishwasher

A dishwasher is supposed to make life easy, if only we could agree how to load it. It's time to settle the argument



FORKS up, knives down and be sure to pre-rinse. Or was it bowls down, knives up? And why do I need to rinse? Isn't that what the dishwasher is for? Deep mystery of the universe it is not, yet proper use of the dishwasher is an endless cause of domestic turmoil.

We all have our kitchen quirks, whether reasoned or the result of years of habit. Now, finally, research provides definitive answers about which loading techniques just won't wash.

The most common mistakes include the placement of bowls and tall items – and there are logical solutions to these dirty habits (see and in diagram, opposite). But settling more controversial dishwasher dilemmas requires a more technical approach. To study how water travels around a dishwasher, [Raúl Pérez Mohedano](#) at the University of Birmingham, UK, and his colleagues injected water with radioactive tracers. They could

then use the tracers to follow the movement of the water when the dishwasher was put inside a scanner. The technique, called positron emission particle tracking, revealed water direction and velocity during a normal wash cycle. It turned up a few surprising insights.

Although most dishwasher racks are rectangular, they found that [arranging dishes in a circle](#) around the centre maximises water flow and leads to cleaner dishes. Water velocities were lowest towards the sides and bottom of the machine, making those areas the [best for placing](#) dishes soiled with protein, such as egg yolk. The slower-travelling water allows the proteins to hydrate and swell, making them easier to wash away.

Dishes soiled with carbohydrates should go closer to the jets, where the mechanical force of the water blasts the grime away. The team found that jets are strongest near the centre of the top shelf, right above the rotating spray arm.

Of course, none of that matters if you overfill the dishwasher and the water can't circulate properly anyway. But how much is too much? You should fill it as much as possible without stacking items on top of each other, which prevents water from reaching all soiled surfaces, says [Rainer Stamminger](#), whose group at the University of Bonn in Germany studies dishwashing habits around the world.

As for the age-old question of whether it is better to [wash up by hand or use the dishwasher](#), Stamminger's group found that [dishwashers use far less water, as well as saving energy and time](#). Given that you first have to shell out for the machine, and the research was funded by manufacturing company Bosch, you might want to take some of the findings with a pinch of dishwasher salt. Then there's the fact that different machines vary in their efficiency. Older machines, for instance, use more water and energy. But water flows from taps at a rate of [up to about 11 litres per minute](#) and some machines use less than that in one cycle. The calculations don't include [the water involved in making the dishwasher in the first place](#). And you could also argue that some hand-washing techniques will be more efficient than others.

Even so, the dishwasher's high temperatures make for a better clean. But this has a downside too. In 2014, researchers in Sweden found that children raised in houses where manual dishwashing was the norm [had a lower risk of developing allergies](#) than those brought up in households with a dishwasher. The team speculated that less efficient washing increases exposure to microbes, leading to [more robust immune systems](#).

Finally, the elephant in the kitchen: to pre-rinse or not? "Don't wash your dishes before putting them in the dishwasher," says Stamminger. [Detergents](#) are designed to bond with food residues, and if they don't have anything to react with, they can deposit on other items, which is one cause of cloudy wine glasses. "Just scrape off any remaining food, load and let the dishwasher do the rest," says Alex Lucas at dishwasher manufacturer Bosch in Milton Keynes, UK. Now all that's left to argue about is whose turn it is to put the dishes away.

(Image: Adam Pointer)

Dishwash tips: Man vs the machine

DISHWASHER TIPS

- 1 Knives should go in the basket blade down to avoid accidents. Spoons and forks can be placed either way up.
- 2 Cups and bowls should be placed face down to prevent dirty water from collecting and soiling clean items.
- 3 Tall items in the centre of the bottom rack or handles hanging down from the top prevent the spray arms from spinning and thus distributing water evenly.
- 4 Place smaller plates at the centre and larger ones towards the sides so that water flows freely.
- 5 Don't let large items block the detergent flap on the inner door.
- 6 Arrange plates in a circle around the centre.
- 7 Place dishes used for egg or other proteins around the sides on the bottom rack.
- 8 Load items soiled by carbohydrates in the centre of the top rack, where the jets are strongest.
- 9 There is no need to pre-rinse.
- 10 Don't overfill: if dishes overlap, water can't reach the soiled surfaces and food will get baked on during drying...but underfilling is a waste of energy.

