



# Sleeping beautifully

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If innovation is not a race but a marathon then Fisher & Paykel Healthcare's product designers are world class endurance athletes.

For the past 16 years the company's design team has been tinkering with, redesigning and progressively improving its line of sleep apnea machines, taking the devices from inception to worldwide technology leader.

Continuous positive airway pressure, or CPAP, devices are used to treat obstructive sleep apnea, a condition where people stop breathing periodically while they sleep.

Using a breathing mask, the devices raise the pressure of the air the patient breathes which keeps their airways open through the night.

It may seem like a highly specialised market, but in the last financial year F&P Healthcare's CPAP machines were sold in 121 countries and brought in almost \$236 million, or 42 per cent of the company's revenue.

"Fisher and Paykel is the only company to successfully enter the market and achieve a meaningful market share in the last 10 to 15 years, so that is a measure of its success... that they are a decent sized player," Craigs Investment Partners senior research analyst Stephen Ridgewell says.

"A number of companies have tried to enter the market but Fisher and Paykel is the only one that has had notable success."

While it has a smaller research and development (R&D) budget than competitors such as ResMed and Philips Respironics, it has been punching above its weight in terms of results, Ridgewell says.

The company has around eight to 10 per cent of the global market for CPAP machines, and 12 to 13 per cent share of the market for the masks that are used with the machines.

"We think Fisher and Paykel has a good future in the industry, but they do face high calibre competitors."

Lead product designer for F&P Healthcare, Subbarao Potharaju has been working on the devices since the first model came out in the late 1990s, and in that time he has seen the design team grow to about 180 engineers.

"It makes me smile when I hear this. When I joined in 1997 I was told 'you are number 19'," he says.

In the beginning F&P Healthcare avoided competing directly with the major players ResMed and Respironics (which has since been acquired by Philips), instead sticking to its area of expertise by producing an add-on humidifier for existing CPAP machines in the early 1990s.

F&P Healthcare has been in the medical humidification business since the 1970s. It started with a prototype humidifier for hospital ventilators made from a glass kitchen jar, and built that technology into an industry standard.

Early model CPAP machines had similar problems to the early ventilators, in that producing cold, dry air gave patients congestion and headaches. By heating and dampening the air these symptoms could be avoided.

F&P's humidification device was effective. However the setup of a separate airflow generator and a humidifier had its limitations.

"Demand for humidity can be dependent on what pressure settings there are, what type of flow is being used. If there are two separate systems the flow generator doesn't have any control over the humidifier," Potharaju says.

The already large sleep apnea market had been growing by four to six per cent a year on the back of the obesity epidemic, and F&P Healthcare spotted an opportunity.

The design team was set to work creating the industry's first integrated system containing both an airflow generator and humidifier.

It hit the market in 1998 and was being exported to the USA within a year.

In 2001 the healthcare side of Fisher & Paykel was split from the appliance side of the business.

The board at the time believed the separation would increase value to shareholders by allowing the healthcare and appliance operations to be valued separately.

CPAP products had become a lucrative venture, bringing in \$63 million in revenue that year.

The USA proved to be the largest market, and now generates 45 per cent of CPAP revenues.

Another quarter comes from Europe, with 20 per cent of revenues coming from South East Asia and this part of the world.

Despite the original device's success, however, the designers saw great room for improvement.

The original air pump motor was an adapted dishwasher drainage pump, and while it was effective it was also quite noisy.

This naturally wasn't ideal in a product designed to help people sleep.

"From that point on we focused on the size of the machine, [asking] 'how do we make the noise come down, make it quieter, and make it comfortable for the patient to use?'," Potharaju says.

With each new iteration the motor shrank in size and weight, making the machine quieter and also paving the way for further improvements.

A smaller, lighter pump could be sped up and slowed down extremely quickly, allowing the designers to raise and lower the pressure in time with the patient's breathing.

F&P Healthcare engineers also found themselves responding to problems and developing innovative solutions, such as creating heating technology to prevent condensation in the breathing tube which would otherwise drip back down into the patient's nose and mouth.

This development has since been picked up by other companies in the industry.

Later model CPAP machines were engineered to automatically adjust the air pressure and record usage information to USB drives for doctors and insurance companies.

The USB drive eventually became a modem, making the process automatic.

The overall design continued to improve, until what had begun as a set of separate humming medical devices taking up most of a bedside table had shrunk into something that looks like an alarm clock (and in fact does play wakeup music).

"You're not maintaining an existing product that's old and tired here, you're always working on

something new,” Potharaju says.

Director of the University of Otago’s WellSleep Research Group Alister Neill says F&P Healthcare was early to recognise that the addition of humidification significantly reduced upper airway problems like runny nose and sneezing.

“It made CPAP more tolerable and so there are some early studies indicating that the addition of humidification does help compliance (people continuing to use the system over time).”

The increased comfort and ease of use has helped shift perceptions of the device, senior sleep physiologist at the Sleep Well Clinic Bryn Sparks says.

Improving public perceptions of the devices has broadened the range of conditions patients are willing to treat with them, including things such as snoring.

“Rather than treating sick people it can be put more into the category of something like glasses or a hearing aid, which are very common things we see, and it’s that level of medicine we see, we’re correcting rather than treating.”

He approves of the direction F&P Healthcare has taken by making the CPAP machines look more at home in the bedroom.

“You put a clock on it, you make it able to play music, what’s that got to do with sleep apnea or the treatment of snoring? Nothing, but it helps make it belong in the bedroom, so the psychological barrier of having this medical device is reduced.”

Potharaju and his team have no plans of stopping innovating any time soon, although F&P Healthcare is cagey about what new features its working on.

But with a history of redefining industry standards its investors and the healthcare industry can expect more to come.

### **What is sleep apnea?**

Obstructive sleep apnea is when a person’s upper airways close off periodically while they sleep, usually for between 20 to 30 seconds. This can happen dozens of times over the course of the night.

It’s estimated that between two and seven per cent of the population suffers from some degree of sleep apnea, with as many as 80 per cent of cases going undiagnosed due to patients not realising they have it.

It is more common in older people with decreased muscle tone, those with brain injuries, and the obese.

Common symptoms include daytime fatigue, slow reactions, vision problems, moodiness, belligerence, as well as a decrease in attentiveness, memory and drive.

Treatments include medication, oral devices, CPAP machines and even surgery.

Long term untreated sleep apnea has been associated with increased risk of car accidents, the development of diabetes, hypertension, heart attack, cancer and stroke.

### **F&P Timeline:**

1970 First stand-alone humidifier sold.

1977 Fisher & Paykel medical division established.

1992 HC100 CPAP humidifier released - a separate device connected to a flow generator.

1998 HC200 CPAP flow generator released, the first integrated humidifier and flow generator in the world.

1999 F&P begins exporting the HC200 to the USA

2001 The company is separated into Fisher & Paykel Healthcare and Fisher & Paykel Appliances. F&P Healthcare has an annual revenue of \$193 million.

2003 Flow generators are introduced incorporating Ambient Tracking Plus technology, tailoring humidity to the conditions.

2004 ThermoSmart heated breathing tube technology introduced, preventing condensation in the breathing tube.

2007 SensAwake technology introduced, sensing when the patient is awake and reducing the pressure to ease falling asleep. The device automatically adjusts pressure as needed through the night.

2008 Flow generators are able to collect data during treatment onto a memory stick.

2013 Latest devices released. F&P Healthcare's makes a profit of \$77m on revenues of \$556m.

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