



Environmental dividends from technological innovation

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Head of Network Cooling Policy and Planning
BT

BT’s introduction of revolutionary fresh air cooling for thousands of network nodes is helping the company to be a more sustainable business while better serving its customers

Hot topic

Few people stop to consider what goes on behind the screens and inside the boxes that constitute the visible face of today’s telecommunications. That’s a pity, because alongside some real engineering elegance there are also serious environmental issues. The clockwork-like apparatus predominant in the 20th Century; the computer-controlled equipment of the last two decades; and the internet protocol-based 21st Century Network (21CN) that BT is installing right now: all of those have something in common. They generate heat.

Keeping cool

Here, one is dealing with the laws of nature. When an electric current passes through a conductor it creates warmth. As you pack conductors closer together, for more functionality in a manageable space, the heat generated per cubic centimetre soars.

Research and development programmes are continually seeking ways to lower waste heat but, as Patrick Gillan, Head of Network Cooling Policy and Planning at BT, explains: “Although BT chooses to work with only the best and most environmentally responsible manufacturers, the fact remains that telecommunications equipment will always need cooling. So we need to ensure that the cooling systems’ impact on the environment is as low as possible.”

Fresh air: a natural asset

As BT approached the design of 21CN it was able to draw upon vast experience of cooling systems design and implementation. It had long ago recognised that traditional refrigeration-based cooling plants compounded environmental issues by consuming large amounts of power (not to mention their noise pollution levels).

As a leading ETSI (European Telecommunications Standards Institute) member, BT has been a major contributor to the formulation of its environmental specifications. Patrick Gillan recalls: “We saw that we could meet the environmental standards using an approach largely based upon fresh air cooling – controlling temperature through fan speed. That seems pretty simple when you say it, but it was a radical departure in telecoms practice.”

The fact that there would be parallel savings in running costs, maintenance costs, and capital costs was a significant bonus. The estimated mean time between system failure of fresh air cooling units would be a truly amazing 5,000 years.

Case study

BT 21st Century Network

“We estimate that we will be making substantial yearly energy savings on the one-hundred-and-six 21CN metro nodes alone. The effects on other services, both now and in the future, will multiply that many times. That will lead to a virtuous circle as our customers start to realise their own sustainability benefits by moving services to BT.”

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An atmosphere of innovation

In parallel with the adoption of this revolutionary approach, BT reduced the number of its cooling system suppliers from five down to two. Apart from the benefit to BT of better leveraging its purchasing power this enabled a strong partnership between BT and the chosen manufacturers, with the co-determination to use innovation in addressing environmental concerns.

A range of fresh air cooling units has been developed to meet telecommunications needs: from wall-mounted models for small equipment areas; through freestanding three-fan units for local telephone exchanges; to large volume plant capable of cooling 36 kilowatts-worth of major trunk exchange. However, there comes a point at which fresh air cooling is no longer practicable. A hybrid unit was therefore also designed, capable of meeting cooling loads up to 46 kilowatts. This achieves the major benefits of fresh air cooling, but with a refrigeration capability that automatically switches in when required.

Offices worldwide

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Virtuous networks

The BT 21CN architecture employs some 5,500 MSANs (multi-service access nodes) at the periphery and 106 metro nodes at the core. The intent for the 5,500 MSANs is to use fresh air cooling units “wherever possible”: it is expected that some 80 per cent will be on pure fresh air. The metro nodes use the high-capacity hybrid cooling unit, although Patrick Gillan observes: “Its controlling software is always hunting for the opportunity to switch to fresh air.” The effect is that BT’s metro nodes are using fresh air cooling only for nearly 90 per cent of the time.

The benefits extend beyond the services provided by 21CN and beyond the shores of the UK. For example, the nodes used in the global BT MPLS (multi-protocol label switching) network around the world will use similar cooling strategies (in the UK they often share accommodation with 21CN). Furthermore, as ultra-resilient BT network nodes increasingly mutate into data centres – for example, assuming responsibility for serving customer applications and storing customer information – the business and environmental benefits will grow even more rapidly.

There are large numbers involved in the cooling equation. Patrick Gillan concludes: “We estimate that we will be making substantial yearly energy savings on the one-hundred-and-six 21CN metro nodes alone. The effects on other services, both now and in the future, will multiply that many times. That will lead to a virtuous circle as our customers start to realise their own sustainability benefits by moving services to BT.”

The bottom line is that customers in the UK and around the world can be reassured that BT network-based services are industry-leading not only in terms of their functionality but also in terms of their minimal environmental impact. Meanwhile the company’s stakeholders see an enterprise that is taking a responsible approach to expenditure on energy, and therefore able to offer competitive pricing allied to good returns.

Business and environmental benefits

The key advantages of BT’s innovation in cooling technology are:

- Substantial yearly energy savings on the one-hundred-and-six 21CN metro nodes, with beneficial effects for other BT services too
- Collateral benefits in terms of BT’s cost base and its ability to competitively price its network-based services
- Positioning BT and its partners as leaders in the field of fresh air cooling, with advantages for export opportunities
- Providing customers with a route to create more sustainable businesses by moving their services to ultra-resilient and environmentally-friendly BT network nodes