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# DC to AC conversion avoids costly plant overhaul at UK carpet maker

Converting spinning frames from inefficient direct current (DC) control to alternating control (AC) has helped increase production capacity of spun yarn at the UK’s leading premier carpet maker, while eliminating motor spare parts, lowering maintenance costs and saving energy.

## Costly carbon brush replacements

All of the spinning frames were DC controlled. As the existing DC motors were obsolete, spares were not readily available. The 75 kW motors needed regular maintenance with each one requiring 12 carbon brushes to be exchanged every year. “This totalled about £5,000, just on replacement carbon brushes across all the DC motors and excluding the manpower needed to carry out the maintenance work,” explains Dave Evans, Electrical Coordinator at Brintons Carpets. “AC induction motors, however, can be repaired or rewound easily, thereby removing maintenance and spares issues faced with the DC solution.”

## Overcoming increased power needs

Brintons’ worked with Sentrledge Control, with whom they have a long term relationship, and asked about the feasibility of the DC to AC conversion. “We have provided Brintons with variable-speed drives and technical back up for many years,” explains Phil Tomkinson, Sentrledge’s Area Manager. “The DC to AC conversion is something we have done before and when Brintons suggested this as a solution to help increase capacity we immediately saw the potential.

“The biggest challenge was the increase in power needed by bringing in the additional machines, with each motor rated at 75 kW, bringing the demand close to 1 MW.”

At first it was thought that the factory’s transformer capacity was not sufficient to handle the increased loading from the additional carding machines and spinning frames. This was because the DC solution gave poor factor of about 0.4, which meant heavy current usage. However the AC solution vastly improves the power factor, reducing current and subsequently active power.

## Try before you buy

Sentrledge undertook analysis on the transformers, logging all loading and calculating various “what if...” scenarios over two weeks. The results confirmed that the 400 A busbars did not need to be upgraded, nor did the transformers have to be increased in capacity. In fact, Sentrledge calculated a significant saving in current across the Canalis busbar system (see table below) thereby avoiding an increase in busbar copper and any change to the installed transformers, substation and switchgear.

	Average kVA	Current A
Traditional DC motors x 12	840	1164
New AC motors x 12	540	744
Overall saving	300	420

## Energy saving brings added bonus

Although energy saving was not the motivation for the conversion, Sentrledge’s calculations showed that a saving could be achieved across all spinning frames of £40,000 per year.

The trial was undertaken with an early generation ABB industrial drive and revealed 19 percent energy savings, equating to 0.5 MW per year. Since the trial, ABB has introduced a more efficient drive, the ACS880, that features 4<sup>th</sup> generation motor control platform, DTC, and the energy savings are even greater, totalling some 504,000 kWh saved. Together with the installation of IE3 ABB motors, return on investment was expected within three years but when the Government’s Enhanced Capital Allowance is factored in payback drops to 2.6 years.

“Energy saving was not the purpose of this project,” says Dave Evans. “It is a bonus. Our intention is not to slow down the process; in fact we are giving the production team exactly what they had before.”

Dave Evans adds: “I have long been an advocate of AC variable-speed drives, with some 50 installed across the site. I particularly favour the ABB drive, primarily because of the ease of use and programming provided by the control keypad. We have, on several occasions, programmed one keypad and then been able to transfer the data from it across several drives.”

**Drive and motor customer benefits**

Improved power factor	AC drives improve power factor over previous DC solution thereby avoiding need to replace transformers and substation equipment.
Energy saving	Latest generation drive provides a 25 percent reduction in energy use.
Keypad friendly	Commissioning and programming of drives is straightforward with simple, direct questions being easy to understand.
Compatible with motors	Sentridge Controls offered a matched pair of ABB drive and motor, making switch over fast.
Simple to maintain	AC motors avoid costly carbon brush replacement and reduce manpower needed to keep DC motors running.
Try before you buy	Installing temporary AC drives meant Brintons could gather data needed to persuade management of the cost feasibility of the DC to AC conversion.

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**Caption:** Brinton Carpets working with Sentridge Controls avoids costly DC to AC plant conversion.

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