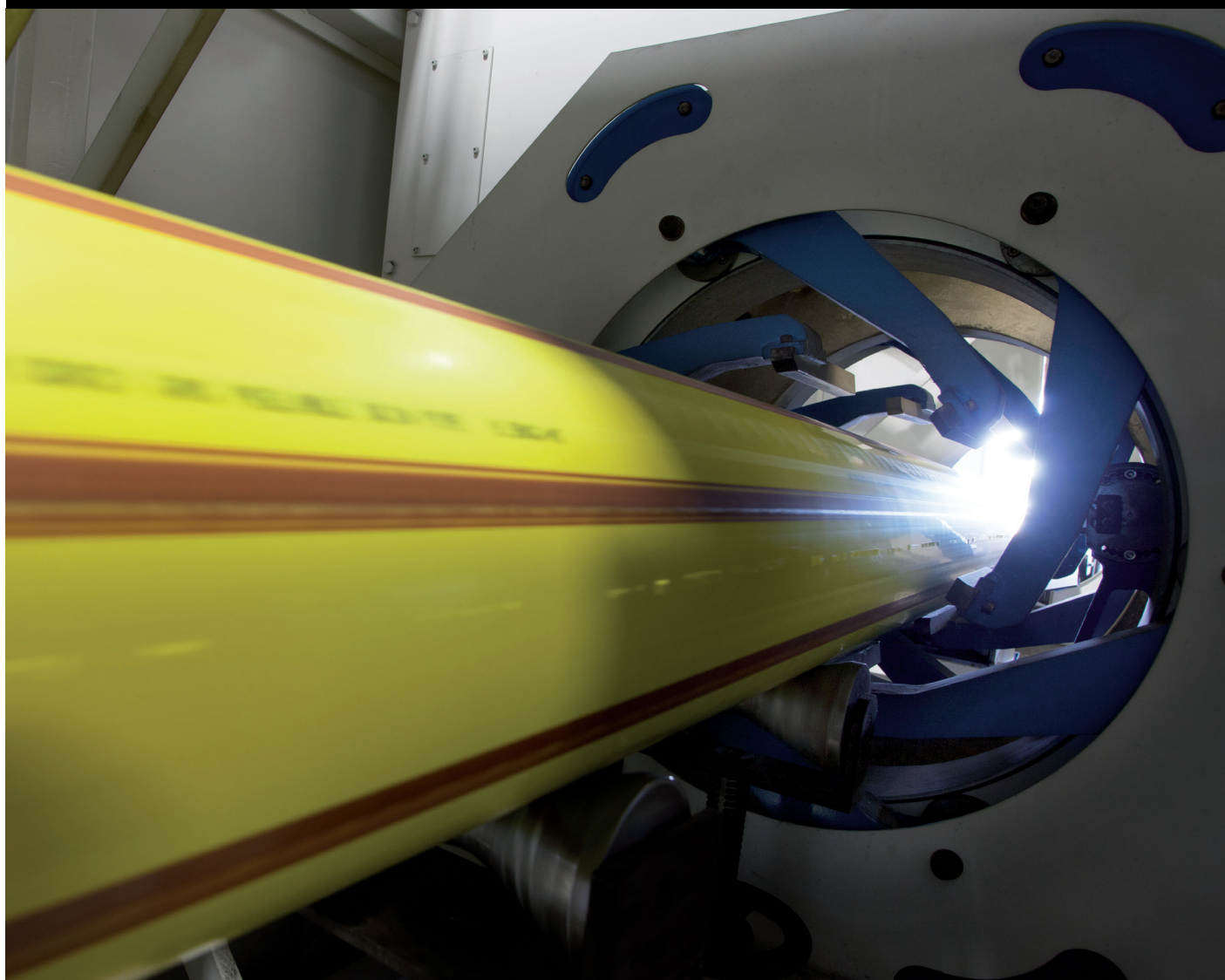


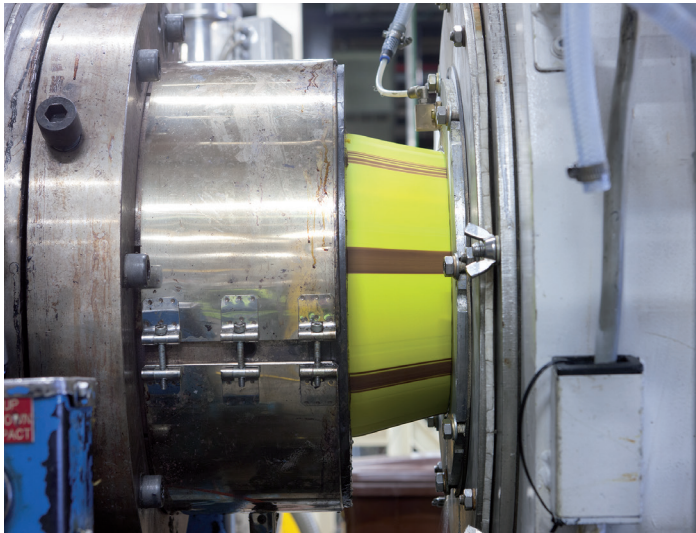
## Case Radius Systems

SynRM improves energy use, reduces maintenance and lowers noise in pipe extruder





At Radius Systems, traditional DC motors powering extrusion lines are gradually being replaced with AC motors in an effort to improve energy use, lower maintenance and reduce noise.



Radius produces polyethylene pipes ranging from 16 mm to 1200 mm and fittings for use by utility companies for gas and water transfer.

## Constant torque application benefits from SynRM technology

Customer benefits	
Energy saving	Up to 15 percent lower energy use contributing to a reduction in kWh/kg of product produced
Lower maintenance costs	About £2,000 cost avoidance on annual DC motor maintenance
Drop in audible noise	Quieter environment improves staff motivation
Near unity power factor at all speeds	Eliminates need for power factor correction equipment
Local support from authorized value provider	Installation and commissioning completed within five days
Direct torque control (DTC)	Avoids need for encoders or tachometers

Up to 15 percent lower energy use, a significant reduction in motor maintenance costs and a drop in audible noise are achieved with the installation of an ABB synchronous reluctance motor and drive (SynRM) package on a twin extruder application.

Radius Systems’ plant in Derbyshire, UK, houses 14 extrusion lines, each of which produces polyethylene pipes from 16 mm to 1200 mm, together with an injection-moulding facility making associated fittings for use by utility companies for gas and water transfer.

Eight lines are powered by DC motors, many of which are over 20 years old. However, Line 12 had a particularly high utilization rate and yet the 182 kW DC motor was regularly failing, leading to an increase in downtime and rising maintenance costs. The company estimates that the annual static and dynamic checks, brush changes and outsourced labor costs alone are about £2,000 per motor.

**“Before” and “after” monitoring**  
ABB’s authorized value provider for the Derbyshire area, Inverter Drive Systems (IDS), was asked to carry out ‘before’ and ‘after’ monitoring of the DC motor on Line 12. This determines the energy savings while confirming that an

investment in an AC motor and drive would meet Radius Systems’ three year capital payback policy.

“Monitoring of the application is critical to the success of any installation,” explains Phil Nightingale, Sales Engineer, IDS. “It allows us to accurately determine the real energy saving potential which means we can size the AC motor and drive correctly. We are often able to reduce the size of the motor and drive package required while exceeding the production targets.”

### Energy saving bandwidth

It was estimated that potential energy savings from a SynRM package for Line 12 would be in the range from 8 to 15 percent, with a return on investment within two years. In addition, in excess of £2,000 cost avoidance is estimated with the removal of DC motor maintenance.

“To pick an exact production run that can give an accurate energy measurement is very difficult to quantify, hence the range from 8 to 15 percent,” explains Rob Betts, Engineering Manager at Radius Systems. “The actual energy saving is dependent upon several process variables such as raw material type, different product ranges and profiles, the temperature at the die and the barrel and the general ambient





The 200 kW IE4 SynRM motor fits neatly into the space vacated by the DC motor in the extruder.



The SynRM motor and drive package proved as effective on the constant torque in extrusion line at Radius Systems as it is on quadratic torque in pump and fan applications.

environmental conditions. For instance, energy consumption is higher on a cold day as more energy is needed to warm up the process.”

#### SynRM: more than a pipe dream

The SynRM is a 200 kW, 1500 rpm, IE4 solution and together with the ABB industrial drive, ACS880, it offers a much higher efficiency than standard AC induction motors and drives. It is also a far quieter package than the existing DC motor. “SynRM has given us a reduction in noise in the production hall which is a benefit we had not expected,” says Betts. “While we have not measured the noise levels, everyone has noticed a definite reduction across the plant, which in itself is a motivational measure.”

A challenge was presented by the physical footprint of the existing DC motor. “DC motors tend to be long and thin,” explains Betts, “whereas AC motors tend to be shorter but bigger in diameter.” However, SynRM can be up to two frame sizes smaller than a conventional induction motor which is a benefit in the direct replacements of DC motors.

#### Challenges of constant torque

While SynRM is well tested on quadratic torque applications, like pumps, fans and compressors, there are fewer constant torque references, such as extruders. A high starting torque is needed at the start of the extrusion process, followed by constant torque to continuously run the line. Previously, only DC motors could meet this high torque necessary for startup, however it is developments in AC drive technology, like ABB’s motor control platform, direct torque control (DTC) that is changing the way extruders are controlled.

**“Betts concludes: “Would we consider a SynRM package again? Most definitely; IE4 and higher efficiencies are the way forward, so provided the price is competitive, the return on investment can be justified and the technology can be delivered to our time frames, then we would have no qualms about using SynRM.”**



**Rob Betts, Engineering Manager at Radius Systems**

Radius Systems, part of the Polyplastic Group of companies, designs, develops and manufactures plastic piping systems for the utilities, telecoms and construction industries. Established in 1969, Radius Systems is the only provider to offer solutions spanning the entire pipe life cycle.



**Radius Systems Ltd**

Radius’s products are lightweight and simple to install, optimized for new and replacement infrastructure. The products make optimal use of materials and offer features including barrier properties, specialist application coatings and simplified jointing practices.

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