

PROCESS ENGINEERING



Better by
design

Plant optimisation



SEWAGE PUMPS
Scottish Water
expects to end
blockages **16**

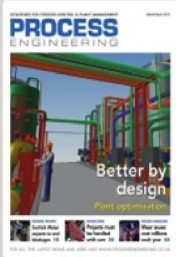


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be handled
with care **20**



SOLIDS HANDLING
Wear issues
cost millions
each year **45**

cover



March/April 2011
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The 3D image from CAD Schroer on our cover illustrates the role of process design and optimisation in projects to establish new process lines or modify existing facilities. Our feature (p23) also highlights leading-edge work at chemical companies Bayer and Repsol in this area.

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Visible benefits

Patrick Raleigh reports on how the latest 3D design software can help engineers avoid costly mistakes when planning new process lines

PROJECTS TO BUILD A NEW PROCESSING LINE CAN typically cost £15–£20 million, so it is critical that the design is right so that the project stays within budget and to schedule and the plant runs efficiently from start-up.

Where complex production processes run on multiple factory levels, these projects require detailed knowledge of what's already there, how it's positioned (hard space) and what space is required to safely run and maintain equipment (soft space).

When there is such spatial complexity, 2D drawings are an invitation to get things wrong or overlook important information, which translates into unplanned downtime and expensive re-work if new lines don't fit into existing spaces or can't be operated or maintained efficiently.

"Many factory owners have project-driven engineering departments handling layout design in-house for multiple sites," explains Bill Wilkins, technical sales manager at CAD Schroer UK.

"[They] are typically using 2D drawings for factory layouts and find it hard to position machinery accurately; to visualise clearance spaces between equipment; and to communicate important project information to non-technical managers."

Integrated checking

By contrast, 3D factory modelling can provide integrated hard- and soft-space interference checking, consistency checking and rules-based design.

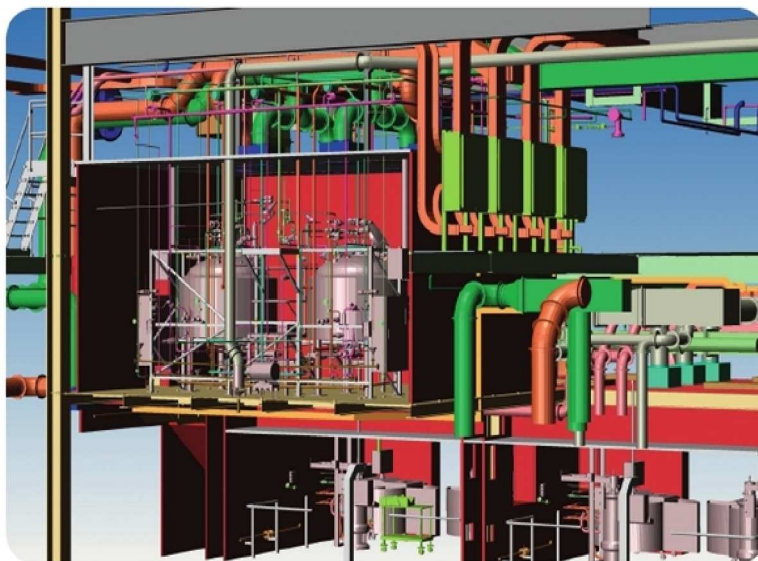
Engineers can then see if large machines will be able to be manoeuvred into place without colliding with other equipment, or if pipework has inadvertently been routed through space vital to the operation and maintenance of other equipment.

Many project engineers find these problems out the hard way: when the equipment is delivered and the roof has to be raised or existing machinery moved, causing additional downtime and great expense.

A lack of up-to-date drawings is a common problem for older, frequently retrofitted, factories. In such cases, laser scanning can provide a 3D point cloud of the factory bay.

The laser technique allows accurate modelling and positioning of existing piping, steelwork, the roof, and any process equipment that is to remain. Redundant equipment can then be deleted and the new line designed.

Where the factory owners are extending existing



factories, or building new bays, it is also possible to create 3D concept designs for project meetings.

"Initially, it's not important what each machine looks like in detail — the overall layout, which determines the type and cost of the equipment required, is the important starting point," Wilkins explains.

In that case, designers can copy existing plant models from previous projects, adding standard conveyors in a matter of minutes. Designs can be edited and evolved to a point where the plans are presented to management, contractors and suppliers in 3D.

Any concept models unique to the new facility can then be replaced by real models of the actual equipment as soon as sourcing decisions are made.

Companies also use 3D models to communicate more effectively with project teams and upper management, all of whom need to gain a good understanding of what a new factory or production line will look like, especially at eye level.

Walk-through visualisations enable users to see across the virtual factory from an operator's point of view and identify blind spots.

With designs that maximise visibility for each operator, planners can minimise the distances staff have to cover to monitor each line, speeding up processing, and making it easy to identify and deal with production problems.

3D modelling can provide an enhanced view of equipment placement

Firms can also use 3D models to communicate what a new factory or production line will look like to project teams or upper management, especially at eye level