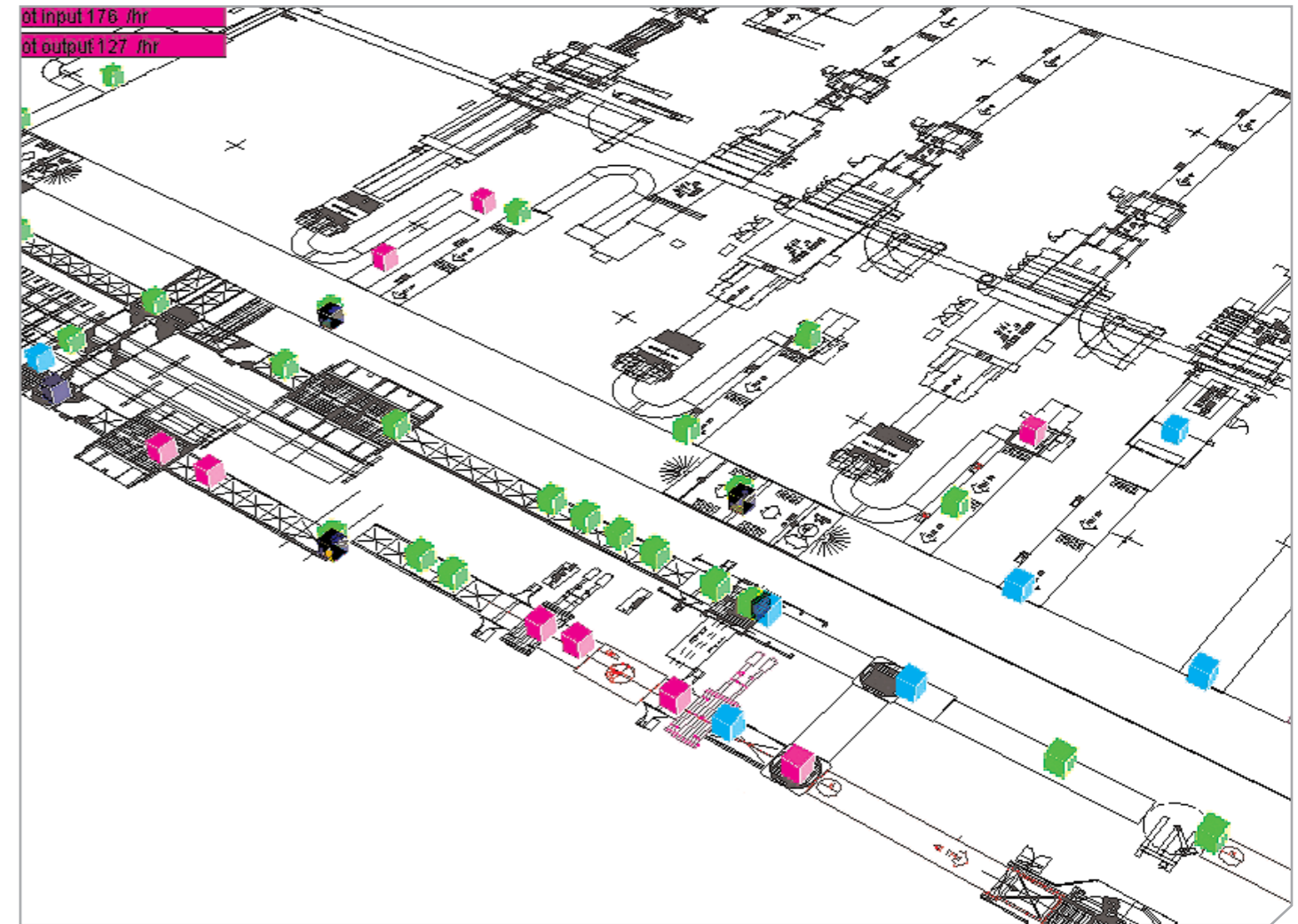




Accurate System Simulation

...Avanti's teaser.



Now offering accurate system simulation

- > Production modelling and analysis.
- > Total system and individual device performance.
- > Graphical & statistical data throughput & output rates.
- > 'Bottleneck' detection.
- > Machine downtime and operator procedures included.
- > 3D Visual representation

Simulated or real success?

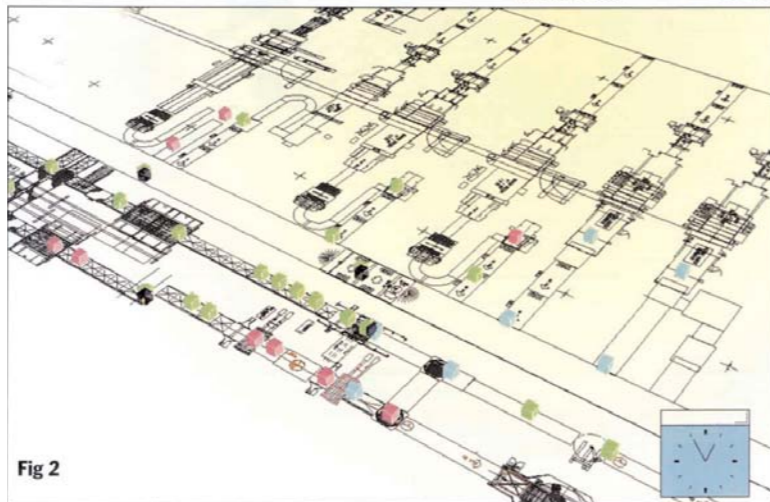
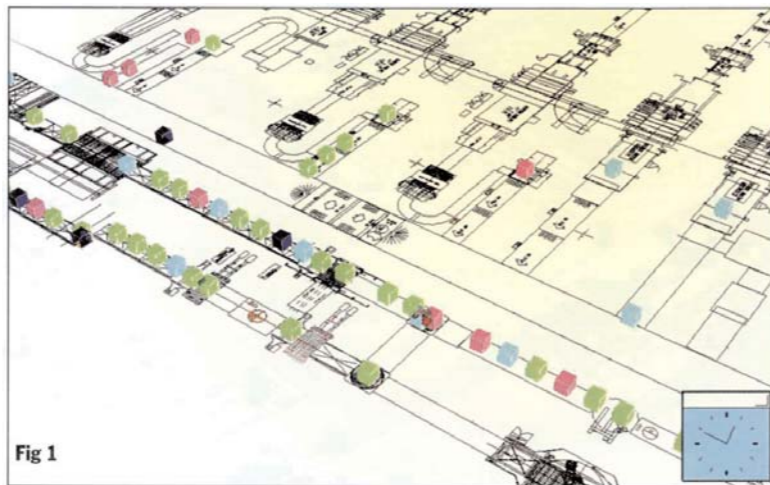
...Avanti's teaser.

Market success for UK-based Avanti Conveyors Ltd has been due to innovative layout designs and clever software controls. This is amazing given that previously the design of the layouts and controls has been based on static analysis, such as spreadsheets, and experience to predict the performance of dynamic system. In a fast moving production environment such as the modern corrugated box plant this kind of guessing is no longer good enough.

On time - no damage

"A correctly designed and performing handling system will present stacks of sheets to converting machines on time with no damage and then processes finished goods through strapping and wrapping at maximised machine utilizations. Such a system cannot be easily modeled with linear calculus based mathematics," says Mr Mander. "However, a system modelled with 'Discrete Event Simulation' lets you take this holistic approach and involves the construction of a computer model that represents the whole production line or system." Simulation has been around for two decades but has previously been prohibitively expensive both for the software and the programming. Just to create a model can cost tens of thousands of pounds. But that's now changed. Avanti have developed a standard model specifically for Corrugated Box plants making each individual client and layout a fraction of this cost. Each machine process and conveyor module has been modeled to accurately predict the performance based on load width, length, height, weight, flute, blank area and required process. Models

have been created for most strappers, stretch wrappers, pallet inserters and converting machines. For input data the plant's own planned schedules are used. This can be orders over an hour, a day a week or a month. This data is normally readily available from the report generators of the plants planning software. In the model the stack rates can be increased so that bottlenecks are rapidly detected.



Downtime included

For any simulation to be worthwhile downtime can be included based on actual records or expected performance. Where an operator has to carry out a function, such as changing wrapping reels when empty or top dressing loads, this is also modeled. Taking the plant's CAD layout for the handling and machines the system also provides a visual simulation in 2D or 3D. The diagrams show a plant which has used simulation to improve stack throughput. Figure #1 shows a "before" actual example of a double strapping bottlenecked at 105 stacks/hour. With small conveyor changes and dramatic control changes the output, as shown in Figure #2 is better than 125 stacks/hour. Also before the changes some converting machines were at below 60% availability due to materials handling blockages and after the changes

100 per cent availability. Often existing systems are so bad that simply observing the simulated throughput rate and visual movement of loads shows the bottlenecks and limitations.

On time - no damage

Running these models produces statistical records and analysis showing machine utilizations, throughputs, buffer levels, blockage and stoppage times, manual interventions and bottlenecks. Figure #3 is a typical output graph and Figure #4 is a transfer car utilisation pie graph. It is particularly interesting to include fork trucks in the model to establish the truck

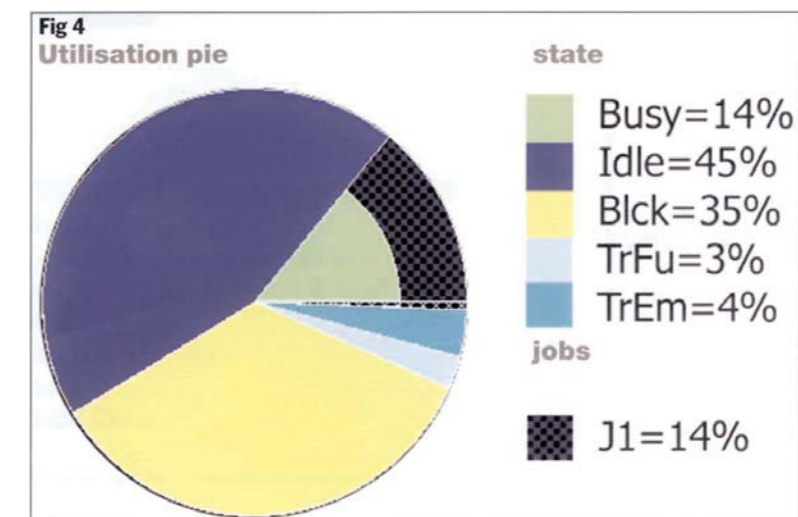
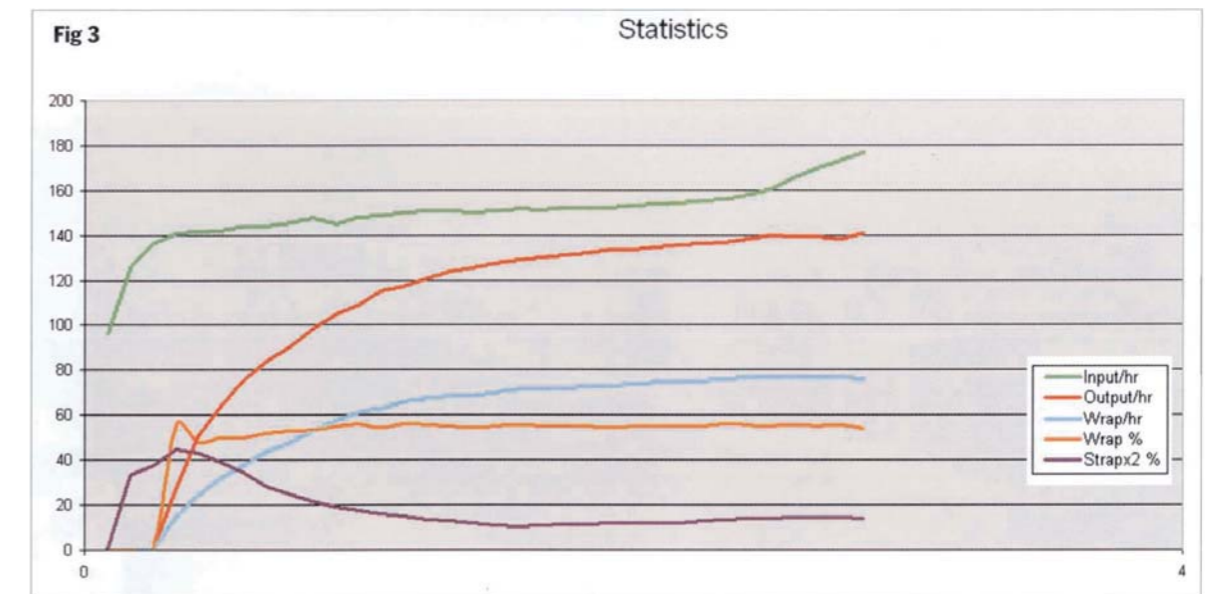
utilisation and therefore the number of trucks really required.

When we look at finished goods system which are bottlenecking the plant the most usual problems are fork trucks not removing loads from conveyors, bad pallets jamming on bad or old technology conveyors and machine downtime - such as strapper failures. Simulation can help with all of these. It determines the fork truck requirement; it dramatically shows the effect of random machine failures and the reduction in throughput due to pallet jamming. The by adjusting the parameters to reflect improving the reliability, or run ability you have a definitive measure of the possible improvements.

Advanced proof of intended improvements is vital as it could be that you spend money solving the wrong problem.

Discrete event simulation has enabled Avanti to evaluate the performance of both total system and individual devices to provide the optimum designs and controls. Often the change necessary to give over 20% increases in throughput has been a simple insertion of one or two conveying zones or even just the control method.

To date Avanti Conveyors Ltd have modelled 9 factories and at 5 have already had the chance to check "before and after" results to verify the simulations. Originally developed to help



improve Avanti's ability as a major conveyor supplier to the corrugated and solid board industries they are now offering this as a service to all clients. Avanti have created the foundations for the models and reports therefore reducing the cost of individual plant models by more than 70%. Avanti's simulation development is continuing with a highly visual 3D simulator for sales visualisations and a visual "Physics Model" to allow full bench testing of PLC and computer control software before installing a system. The latter is dramatically reducing the on-site commissioning time for improved system.