Gob Assist: a lot to gain!

XPAR Vision is dedicated to the development and implementation of hot end sensor technology for the global container glass industry. Applying these technologies brings huge savings within reach! The focus of this article is the Gob Assist.

Many readers will know and/or have experience of the XPAR Vision infrared (IR) camera system at the hot end for inspection and process control. When this technology is properly applied, glassmakers increase the effectiveness of inspection and gain much more knowledge about the glass forming process, allowing them to create better skills for its control.

Fewer customers perhaps have experienced the XPAR Vision infrared gob weight control system, which monitors the weight of products and automatically corrects the weight by adjusting the tube height. This system is an add-on to an infrared camera system and as such, forms an integrated system with the infrared camera system.

The Gob Assist (GA) development monitors the speed, length, position, shape, orientation, time of arrival and trajectory of the gobs falling into blank moulds, without coming into contact with them. Armed with this information, it will be possible to find and maintain optimal gob loading easily and to retrieve optimal gob loading after equipment and/or job changes (see figure 1).

The Gob Assist consists of a camera module that glides along a rail system (figure 2). Although all IS machines are different and most existing IS machines offer only limited free space, the design of the camera module is such that it fits nearly all existing IS machines.

The rail system is robustly attached to the IS machine and enables the camera module to move to all different sections. The cameras take images at a speed of 500 frames per second. Both cameras start taking images when the gob leaves the deflector and stop when the gob has fallen completely into the blank mould. In this way, the whole trajectory is imaged. The XPAR software then processes this sequence of images in near real-time.

A LOT TO GAIN

Currently, GA systems are running at Wiegand Glas Steinbach, Ardagh Glass Nienburg and Ardagh Glass Dongen. To date, the results are very promising, with one customer making the statement "finally the light is turned on". Based on current knowledge, it can be concluded that by using the GA, deviations due to gob loading will decrease dramatically. And as a result, huge savings and/or improvements are within reach.

DECREASED DOWNTIME

Downtime will decrease, due mainly to less blockages of cavities due to bad loading, less changes of blank moulds, less changes of deflectors and troughs, improvement of quality of input, gob forming and gob distribution and last but not least, no more variation due to uncontrolled and uncontrollable behaviour of the operator.

Figure 3a provides an insight to speed changes during a five week interval (speed of the gob falling into the blank mould). Figures 3b and 3c show position changes in one (X) direction and gob lengths changes as an immediate result of these speed changes. As can be concluded, the images show many step-wise changes (speed varies from 5000 – 7000 mm/s and position in one (X) direction varies in a range of 12 mm). As these step-wise changes are the direct result of operator actions (swabbing, change of position etc), it seems to be justified to conclude that operator actions do not per se lead to a decrease in process variation but most probably lead to an increase in process variation and thus to a lower quality level.

INCREASED EFFICIENCY AND PRODUCTIVITY

Efficiency will increase due, for example, to a reduction of swabbing cycles (missing due to swabbing), increased lifetime of moulds (less mould changes), a reduction of oil usage, optimised coating and >

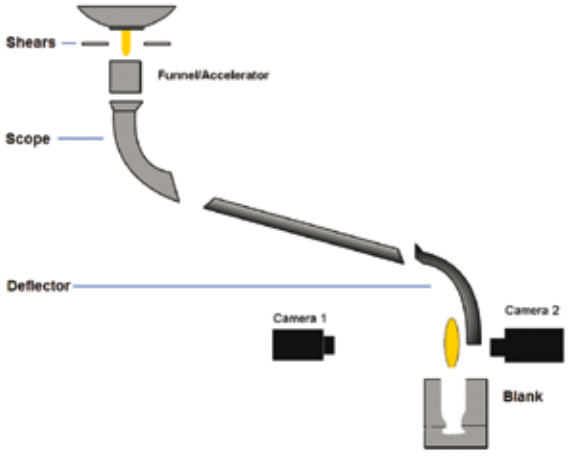

Figure 1: Gob Assist monitoring falling gobs into the blank mould.

Figure 2: The camera module glides along a rail.

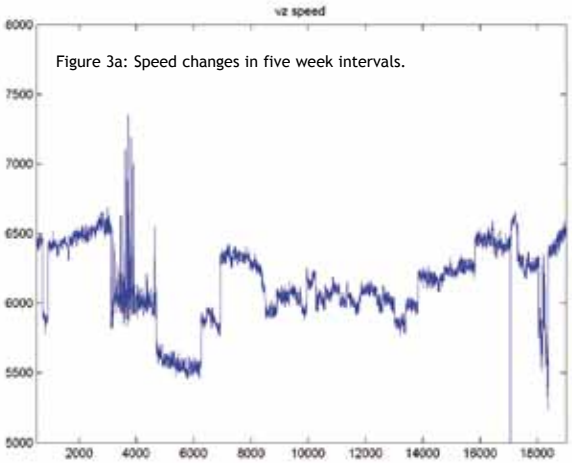

Figure 3a: Speed changes in five week intervals.

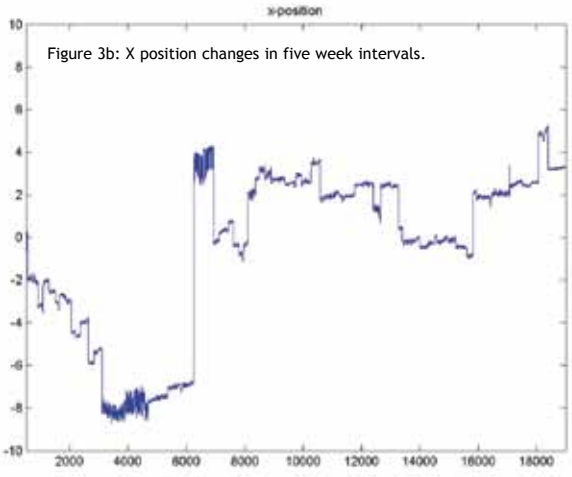

Figure 3b: X position changes in five week intervals.

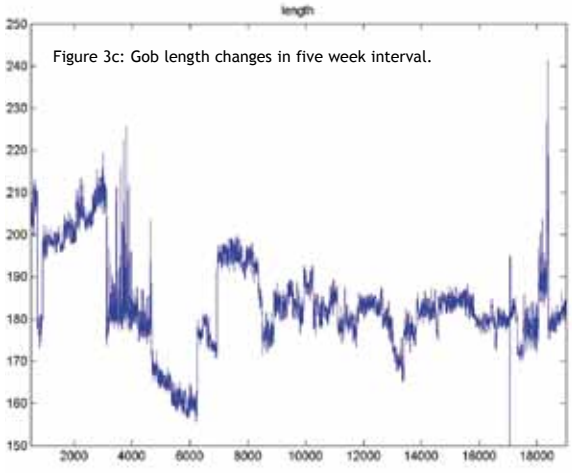

Figure 3c: Gob length changes in five week interval.

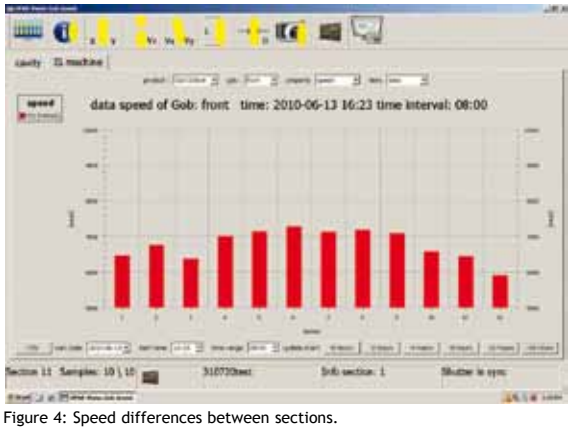

Figure 4: Speed differences between sections.

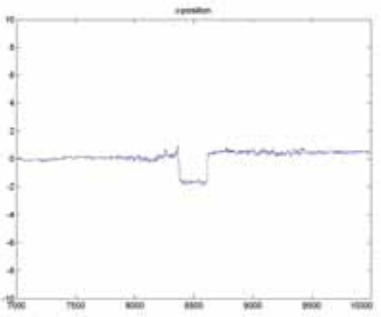

Figure 5a: 2mm position change.

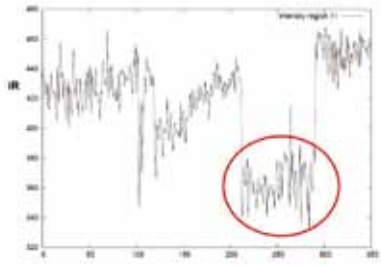

Figure 5b: Effect on neck infrared radiation.

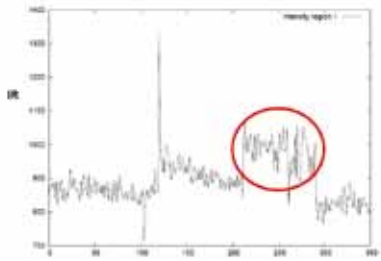

Figure 5c: Effect on bottom infrared radiation.

also (partial) redesign of IS machine construction.

Figure 4 gives an insight to speed differences between sections. It clearly shows a lower speed at the outer sections compared to the inner sections. These differences in speed are a direct result of the design of the IS machine. If not compensated, these differences continue to exist and will lead to differences in quality of output from the different sections.

IMPROVED QUALITY

Due to improved process control (gob loading control), the quality of output will improve and/or defects will decrease. Well known defects related to gob loading are glass distribution (thin glass), visual defects, stuck bottoms, freaks and/or deformations of body.

In order to prove the sensitivity to quality of a (very small) process variation, a controlled experiment was conducted, by which the position in one (X) direction was changed by just 2mm. Figure 5a gives insight to this 2mm position change during a short time interval. Figures 5b and 5c show the effects of this position change on infrared radiation of neck and bottom area respectively, as measured by the infrared camera system. The results speak for themselves; even a small position change of the deflector (unseen by human eye) leads to a shift in glass distribution and thus influences quality.

INCREASED JOB CHANGE PERFORMANCE

A higher level of control of the gob loading process also leads to an increased job change performance due to a reduction of variations over sections (by defining guidelines for time of arrival, dimensions, speed and position and by using availability of reference data from the former run), due to a sustainable set up of the delivery system (height, X/Y position etc) and due to the knowledge of the influence of cleaning, material changes etc.

CONCLUSIONS

With the Gob Assist, it is possible to measure accurately and visualise the gob loading process in terms of speed, length, position, shape, orientation, time of arrival and trajectory of gobs falling into the blank moulds. Based on what has been observed to date, even in the better factories, the level of process variation and the level of uncontrolled operator behaviour are still very high, influencing the quality of both process and products negatively. As a logical consequence, there is still a lot to gain! And with the help of the Gob Assist, it is possible to easily find, maintain and retrieve optimum gob loading within seconds, thus eliminating a significant source of process variation. The result is a more stable and predictable glass forming process, with fewer inefficiencies and quality issues, as a result of which the glass container manufacturer has lower costs, more throughput and higher profit. ■ ■

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