Intelligent mills

Helping existing flour mills to utilise & benefit from emerging innovations

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Traditionally, flour mills were smaller in size and had a large number of millers and workers, making it easy to make adjustments and ensure the mill was running at optimum efficiency. Most mills are now operating at higher throughputs with fewer millers on site, resulting in a complicated system that must be adjusted to achieve optimal performance with only limited numbers of hands-on-deck.

Although every milling company strives for the highest extraction rate in their production, maintaining the mills in a balanced and efficient state for an extended period of time is tough to achieve. It is inevitable for us to step into this new era of milling with thousands of sensors and artificial intelligence. Even with these advancements, nothing can replace the necessity for an experienced miller who knows his mill, its flow, and the machinery like the back of his hand.

New mills with enhanced technology that allows for immense transparency are continuously emerging, but how can older mills utilise and benefit from these new innovations? What technologies can be applied in these factories to help millers get high extraction rates while minimising downtime?

An important part of a miller's job

One of the challenges faced by most mill operators and plant engineers occurs while conducting a mill survey, especially when the factory is of higher throughput. Such personnel can only make logical decisions and adjustments on the run if they have immense experience or are relying on accurate information made available in real time.

It was estimated that about 254 samples, taken in a strategic chronological manner, are required to perform a complete mill survey in a 660TPD flour mill. Every sample taken must undergo a series of tests including capacity and sieve test, ash content, ash curve, light index etc. for several flour streams.

Mill survey is an important part of a miller's job, and due to the complexity of the milling system, it demands an immense amount of labour to do correct sampling and detailed and reliable analysis of each sample. If any quality concerns are detected, changes must be made, then further sampling and testing is required to

confirm analyses results.

Additionally, it is a common experience that mill operators make changes in the plant for only one grist but do not undo the changes made. From that point on, a mill imbalance will occur gradually and unbeknownst to the operators until it causes a huge problem that cannot be traced without performing another complete mill survey or mill assessment at least to ensure all passages are working efficiently.

This results in higher operation costs. Thus, mill operators will be interested to know what can be added to the existing milling process to ensure optimum and balanced milling performance.

What is intelligent milling?

Once a miller sets up a mill to the desired performance, an intelligence system must be integrated to ensure that the mill continues to run at the same efficiency as originally set.

This is especially important in flour mills with limited staff (remote areas) where constant performance checks are not feasible. Intelligent milling is basically the utilisation of data generated from monitoring systems and sensors to ensure:

1. Quality, capacity, and efficiency of a flour mill is maintained in daily operations.
2. Any changes made to the system can be reviewed quickly.
3. Mill operators can foresee maintenance requirements.
4. Mill operators can foresee product degradation.
5. Millers are making decisions with quantifiable inputs.

An intelligent milling system

In recent times, a range of equipment and services have been made available to allow older mills to replace or retrofit core equipment or additional specialised equipment that help provide transparency in the flour milling system.

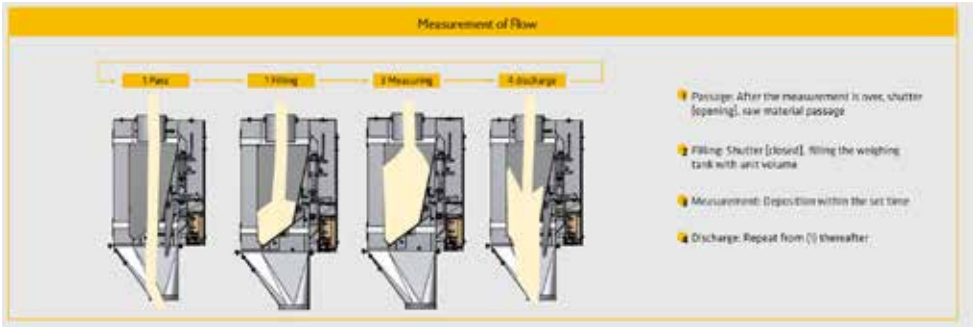
Henry Simon has introduced three advanced core milling equipment, namely, Roller Mill, Quadro Plansifter and Purifier. These equipment have a range of sensors which continuously collect data and provide user information, maintenance data, screen information, operational information (radius of oscillation, rpm, for example) on their display or for export to the MCC. The intelligence system also enables and sends notifications when parameters are outside normal range or standards, enhancing product quality control.

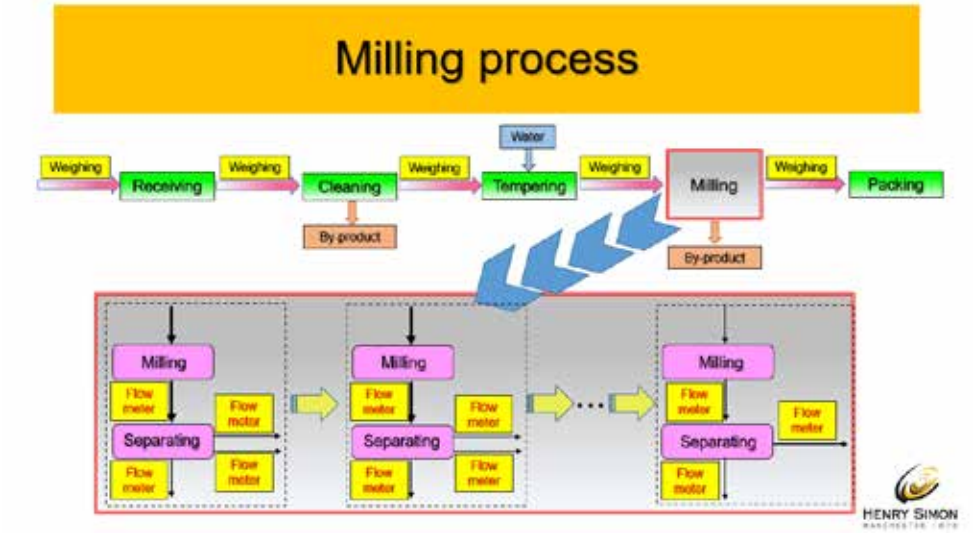
Another crucial aspect of flour milling that may requires intelligent technology in most of the existing flour mills is to ensure individual passages meet expected capacity and quality. In a normal milling process, the stock is weighed at the intake, cleaning, and tempering stages. However, after 1st BK the weighing process takes place when flour is extracted in various flour streams.

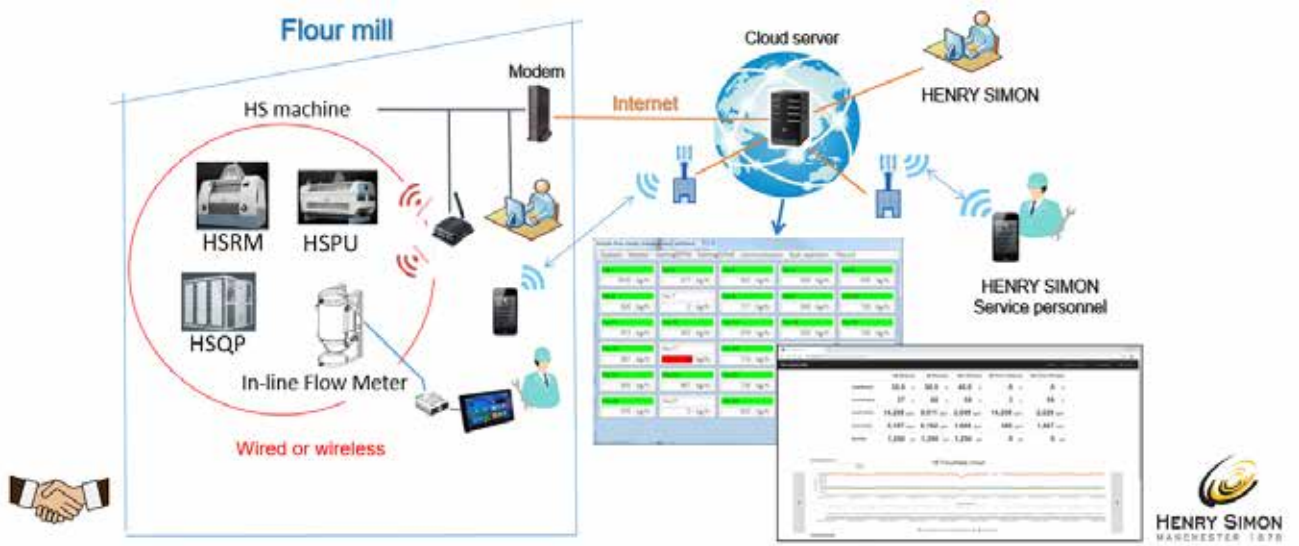
Henry Simon's HSIFM in-line flow meter allows for real time capacity analysis of any milling passage. Simplicity is at the centre of HSIFM's design, it was made with low power and air requirement and can be mounted along mill spouts within minutes and without requiring special installation work or disruptions.

The HSIFM's operation can be described in four simple steps. First, the bottom valve remains open, allowing product to flow in the spout. At a set interval, the bottom gate closes, and product fills the chamber for three seconds. The weight is then measured, and the product is discharged.

This operation is repeated every three minutes along a spout being monitored Weight data obtained will be used to generate plots of the product flow rate and trends which can be analysed in







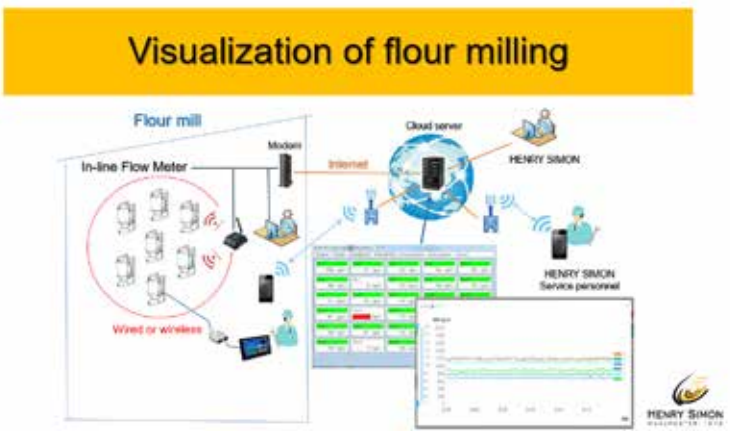
real-time.

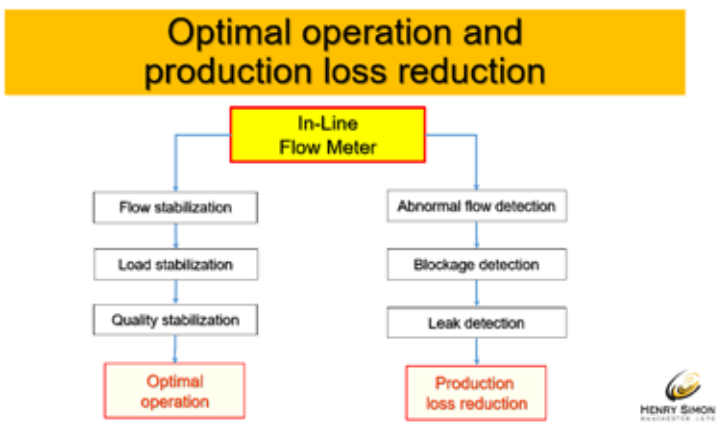
When installed at critical or all passages (Figure 3), a complete dashboard (Figure 4 and Figure 5) of the mill can be created, allowing for easy adjustment and manipulation of passages to achieve better results. The HSIFM is designed to convert any mill into a smart mill.

This data can then be exploited to make changes in the plant, such as analysing particle size distribution results in real time. In addition, it aids millers to detect potential maintenance issues early including abrupt changes in flow rate – like in the event of blockages or overflow etc. (Figure 5)

The HSIFM allows for continuous mill survey without any down time, amendments or re-routing of the product flow.

Another benefit which HSIFM offers is to monitor and ensure feed balances between passages, which is a necessity but not easily accomplished or maintained every day, such as providing even feed into purifiers or sifters.





Efficient, balanced & optimum

In summary, it is inevitable that traditional mills must incorporate some form of intelligence in their plants to compete with new automated mills. Therefore, the retrofit technology offered by the HSIFM allows older milling plants to adopt smart milling technologies with minor adjustments to their design.

The resulting milling system after incorporating the HSIFMs has the potential to provide an efficient, balanced, and optimum mill in operation at any given time with minimal downtime due to maintenance or breakdowns.