Technical Article November 2011

Maestro: A New Weft Monitoring Approach!

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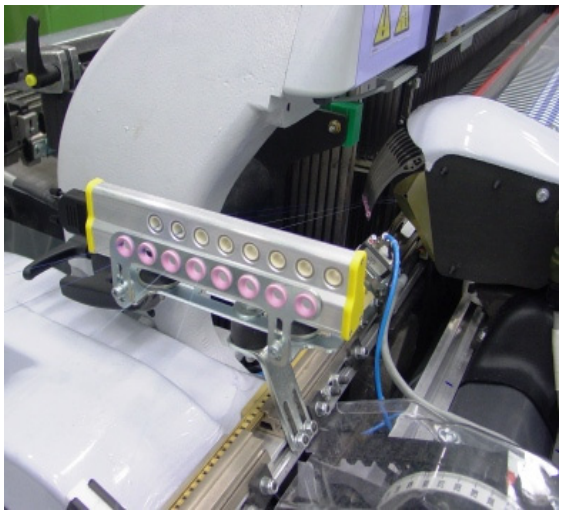
Rapier looms have long since been equipped with a weft detector based on the piezoelectric effect. During weft insertion, the rapid movement of the weft stimulates the piezo crystal to produce a small signal. Utilizing amplification and electronic circuitry, the weft detector causes the rapier loom to stop in the event of weft breakage.

Today's weft stop detector systems are used in such a way that the detector gives very little information to the micro-processor of the rapier weaving machine. In very basic terms, the weft detector signals the loom to continue to run or to stop. Certain advanced types of weft detectors allow detection of desired or undesired double insertion, but no other information is transmitted to the loom other than the "go / no go" decision made by the detector itself.

In most situations, weft detectors require significant time & attention in the creeling of packages and the thread-up of weft yarns through the detector eyelets. Double insertion must originate and be maintained from designated eyelets and it is not always possible to change. Also, mixing of the same weft in single and then in double insertion is not always possible. Further, even if the detector offers an individual sensitivity setting for each eyelet, the procedure is complex and requires an experienced technician.



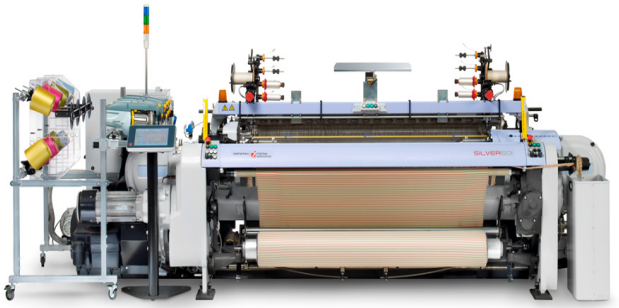


Fig 1 shows the Maestro weft detector on the Silver 501 as it was introduced during ITMA 2011 in Barcelona

During ITMA 2011 in Barcelona, ITEMA introduced the Maestro Weft Monitoring System on its new Silver 501 Rapier Machine. Maestro, unlike any of its competitors, uses a special weft detector that transmits signals from each eyelet to the micro-processor of the loom. Innovative software from the loom's micro-processor allows real time analysis of the signal and thus efficient handling of all weft breakage conditions.

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The weft detector has been designed to produce a numerical value for each of the 8 or 12 eyelets of the detector. If no weft is inserted for a given position the signal value will be extremely low (the signal noise level), if a weft yarn is moving in the eyelet, the numerical value can go up as high as 4000, thus offering a very good signal/noise ratio. For each pick insertion, the 8 or 12 numerical values are continuously transmitted to the loom's micro-processor, multiple times for each pick. In fact, the numerical values are transmitted for each degree of the weaving cycle. The data communication between weft detector and the loom's electronics is handled by a very fast and secure means of data communication. Clearly this weft monitoring method also requires a fast loom micro-processor. With ITEMA's new electronic NCP (common electronic platform for all ITEMA's loom types) which was also introduced during ITMA 2011, the required computation power is guaranteed even at extremely high rapier weaving speeds; such as the 750RPM demonstrated on the Silver 501 during ITMA.

Fig 2: the touch screen console allows the weaver and the technician to operate the Silver 501 in a very user friendly way.

With transmission of the numerical values, the software is capable of drawing the insertion curve for each eyelet of the weft detector. This curve can be viewed on the touch screen display of the weaving machine. The insertion curve is available for each of the 8 or 12 eyelets of the weft detector.

Typical to other weft detection systems, the sensitivity and control zone have to be defined. With the Maestro System, the control zone is defined specifying the degree in the weaving cycle for the start and stop of the 2 zones in which the weft insertion is controlled. The first zone goes from the beginning to the middle of the insertion; the second zone from the middle to the end. In each of the 2 control zones, the software will check if the numerical value of the inserted weft is above the threshold. The thresholds are predetermined and defined for each eyelet. This is an easy procedure by using the up/down arrows on the touch screen display. Therefore, the need to use potentiometers or other setting methods is eliminated.

The individual sensitivity setting or definition of the threshold does not make the Maestro more expensive, all functionalities are handled through software. During weaving Maestro will continuously compare if the numerical values transmitted by the weft detector stays, while in a control zone, above the defined threshold. If not, Maestro will stop the loom for weft breakage.

Another feature of the new Maestro System allows the weft pattern information to be linked with the signal processing of the numerical values provided by the weft detector. This is completely automatic, requiring no technician intervention. What does this mean?

- If the weft of one eyelet position has to be inserted and for some reason another weft is inserted, Maestro will detect this and stop the loom.
- If two wefts are to be inserted and for some reason only one or three wefts are inserted, Maestro detects this and the loom will be stopped.
- If two wefts are to be inserted and for some reason one of the two wefts is the wrong one, Maestro will detect this and stop the loom.
- The same applies for any other wrong insertion, be it a triple or quadruple insertion; in every case – if the signals transmitted from the weft detector are inconsistent with the weft pattern, Maestro will stop the loom.

Because of this functionality any malfunction of the weft selector or any case where a weft yarn gets entangled with a neighboring weft, Maestro will stop the rapier loom. Clearly Maestro is a further step in the direction of a rapier weaving machine which guarantees perfect fabric quality.

Some further words concerning the definition of the thresholds, which can be set individually for each eyelet. For a fine weft yarn count, the numerical value will be lower than for a course yarn. If the technician wants to weave with minimum weft yarn deflection (weft yarn as much as possible in a straight line) the numerical values produced by the weft detector will be lower. Maestro visualizes these values and illustrates the weft insertion curve on the loom's display. The technician can easily define the individual threshold for each weft yarn in such a way that every weft break will be detected without creating false or unwanted weft stops. The insertion curves also allow the technician to have a clear view of the signals received at the end of the weft insertion. This allows him to weave with the longest weft control zone. What is meant here is that the yarn will be monitored to the point the weft is released from the gripper. This feature certainly serves to eliminate defects for short picks while also preventing false stops. Further, a more controlled and precise release from the gripper is assured. Consequently, the Maestro System also reduces weft yarn waste.

With Maestro, ITEMA introduces a new look at weft monitoring and the detection of weft breakages on rapier looms. Thus, the complexity for the technician is removed and handled by the software operating with the micro-processor of the weaving machine.

Without adding cost to the weaving machine, the Silver 501 rapier loom assures better quality with Maestro in charge of weft detection.

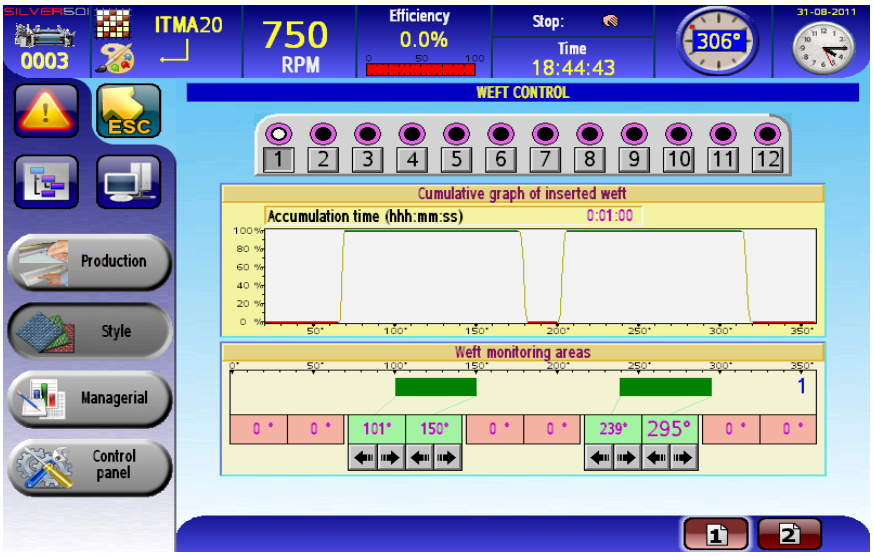

Fig 3: there are 2 zones where the weft insertion is checked by the software. The settings are easily entered and predetermined on the touch screen for all positions (1 up to 12).

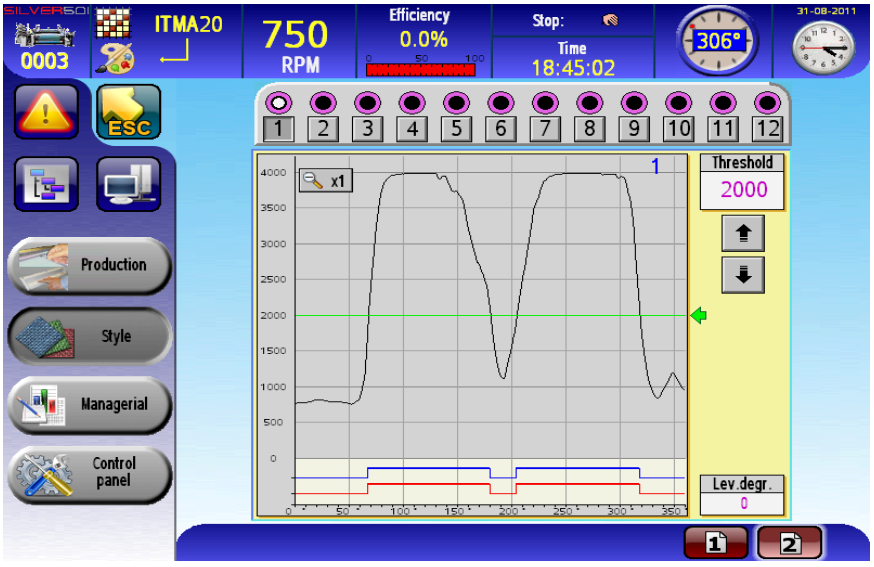

Fig 4: the weft sensor transmits at high speed for all positions of the sensor signal. This signal clearly illustrates how the weft is transferred through the shed. The green line and arrow indicates the threshold setting. If the weft signal drops below the threshold in one of the zones in which the weft has to be checked, the weaving machine will be stopped.