

MALCAM's PRB-20 – Pattern Recognition Density Quality Software Package

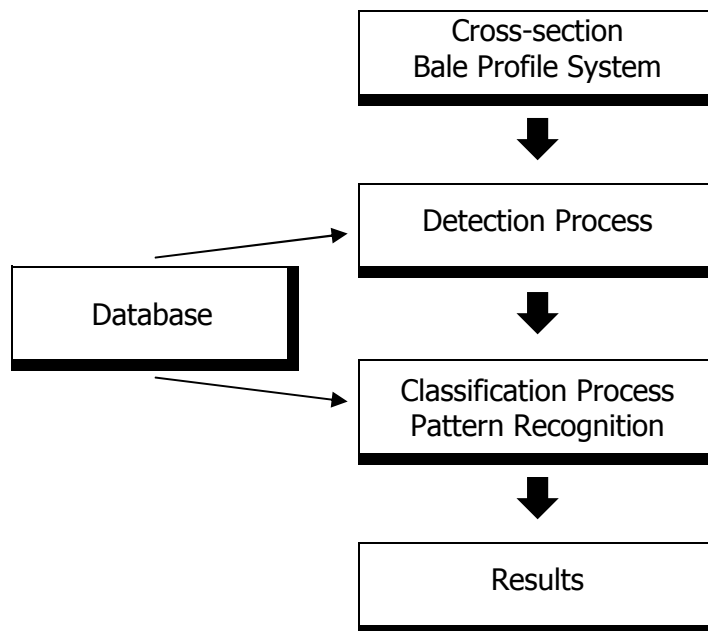
A classic tool for detection and classification of irregularities in bulk materials, also optimal for real-time evaluation of fermentation quality using density profiles

Overview

The PRB-20 is an automatic pattern recognition bale profiler system which is one of the building blocks in MALCAM's INS-20 information networking statistical platform. Allowing real time, automatic detection of non-uniform areas (such as wet spots and air pockets) inside scanned cases and bales, the PRB-20 represents a new patented approach, both theoretically and in practice, made possible through the integration of advanced pattern recognition technology.

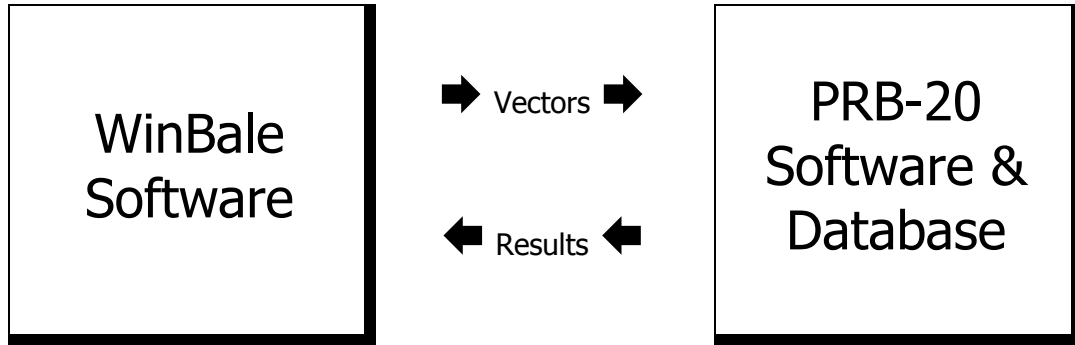
The main advantage of this pattern recognition program to plant automation is that it provides a set of powerful tools for accomplishing complex tasks with minimal intervention in the production line. Since it is not possible to compile a general-purpose automatic pattern recognition solution, resources must be directed towards task-specific solutions that rely on an understanding of the production procedure.

Using the PRB-20 system, once the bale has been scanned by the MMA-4020 system, a profile of the bale is sent to the PRB-20 software. A pattern data profile process is then applied to the data, together with a powerful data analysis program, creating a database pattern, statistical sampling and evaluation of the results.



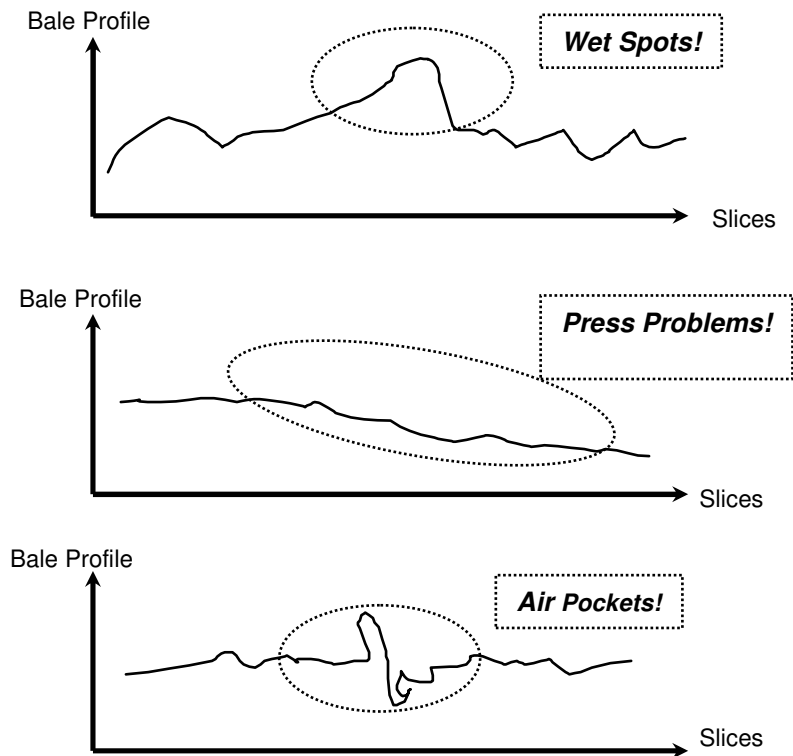
Block Diagram of PRB-20 Operation Process

The PRB-20 software package works together with MALCAM's WinBale software. Scanned data is transferred from the WinBale as profile vectors to the PRB-20 software, which then implements pattern recognition algorithms on the vectors to build a database of features which provide the best match and determine any inherent target/problem/defect. The PRB then sends a result message to the WinBale, which displays the results and records them in its database.

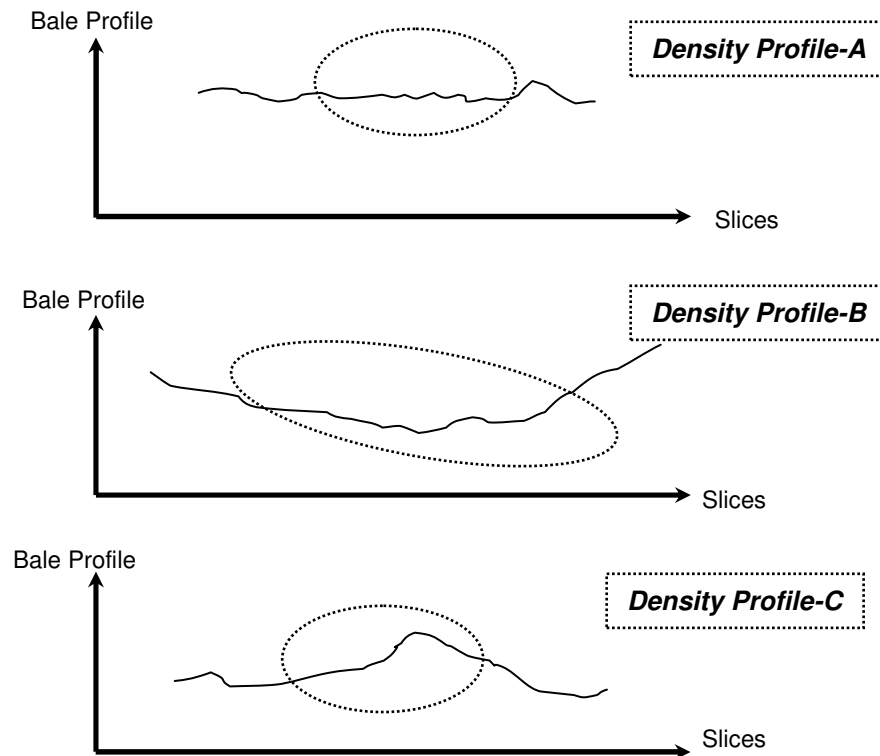


Data Transfer between PRB-20 and WinBale

The PRB-20 software processing cycle provides highly sensitive, automatic online 3D information on all scanned bales as they pass on a conveyer belt between the two MMA antennas, indicating a predicted location of a problem in the scanned bale.



Typical Examples of Pattern Profiles from PRB-20



Density Profile-A : Uniform C-48" bale : Class-A , the best from Fermentation processes

Density Profile-B & C: Uniform C-48" bale., Class-B,C , less good tobacco quality from fermentation processes

Theory of Operation

Installation & Initial Learning Phase

Note: Installation of the PRB-20 package must only be performed by the manufacturer's personnel, or official, approved affiliates of the manufacturer.

The PRB-20 installation process includes installation of the PRB-20 package and initial set up to start work. This covers creation of a basic internal bale profile defined as a family configuration (Normal, Abnormal) for at least one scenario, and collection of data for each of these family definitions.

The collected data is then sent to the manufacturer's headquarters for parameter analysis and calculation, after which the received parameters are loaded into the MMA system for basic internal bale recognition by the MMA.

Second Learning Phase

Note: The PRB-20 second learning phase is for use by personnel trained by MMA System Administrators only.

The PRB-20 software package receives a product profile (a vector) based on 100 MMA processed readings made on the scanned case/bale, which is then translated by the software to show the pattern of the case/bale i.e., the estimated moisture vs. density deviation of the bale. Since this data is based on 100 processed readings from a single case/base, it enables a reliable and detailed view of the density vs. moisture variations in each case/bale.

In order to perform these operations, the PRB-20 requires the definition of families of patterns i.e., the definition of the density vs. moisture combination for a "Normal" case/bale profile, and the definition of "Abnormal" results i.e., abnormal density vs. moisture levels indicating a defect. Consequently, while there can be only one Normal family, there can be a whole range of Abnormal families, depending on the source of the density/moisture defect e.g., press problems creating uneven pressing of tobacco, wet spots in scanned bales and/or other non-uniform profiles.

Consequently, the PRB-20 learning phases requires the learning of possible defects and their division into sub-families of the Abnormal category e.g., Abnormal-moisture distribution and Abnormal-press problem for each scenario. This is performed as follows:

1. Define a new subfamily of abnormal patterns/defects.
2. Collect typical data for the subfamily in your plant.
3. Send the data to the manufacturer's headquarters for parameter analysis and calculation.
4. Load the parameters received from the manufacturer into the MMA system.
5. Track the results and decisions made by the system.

Optimization Phase

Note: The PRB-20 optimization phase is for MMA System Administrators only.

For optimal operation of the PRB-20 software, it is necessary to define an "Undefined" family, which will contain all patterns with unknown defect sources i.e., patterns/defects that could not be categorized to a one of the defined families of abnormalities with the defined level of certainty. This operation is performed as follows:

1. Collect typical data of unknown patterns/defects in your plant.
2. Send the data to the manufacturer's headquarters for parameter analysis and calculation.
3. Follow the manufacturer's recommendations for further actions.

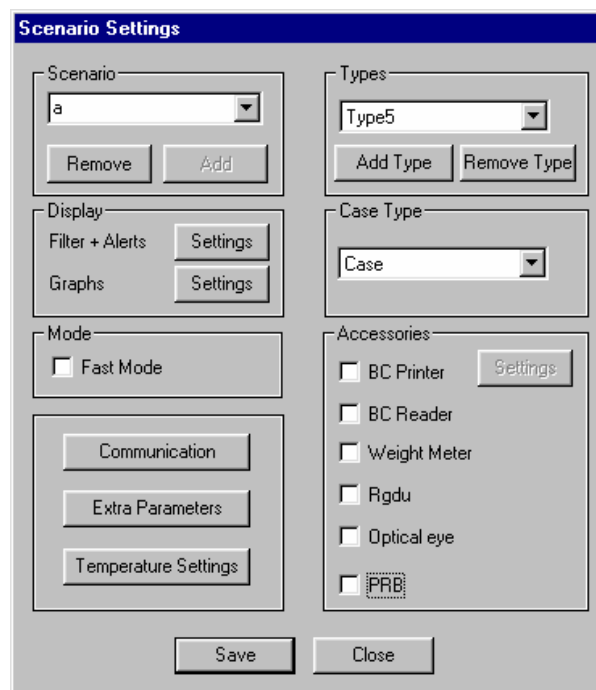
Working with the PRB-20 Package

The following is a description of the main operations for working with the PRB-20 package.

Enabling the PRB-20 in WinBale

For the PRB-20 software to work with the MMA system, it must be enabled in the WinBale operating system. This is performed by activating the PRB option in the Scenario Settings screen.

In the WinBale main screen, select Scenario Settings in the Administration menu. The Scenario Settings screen is displayed:



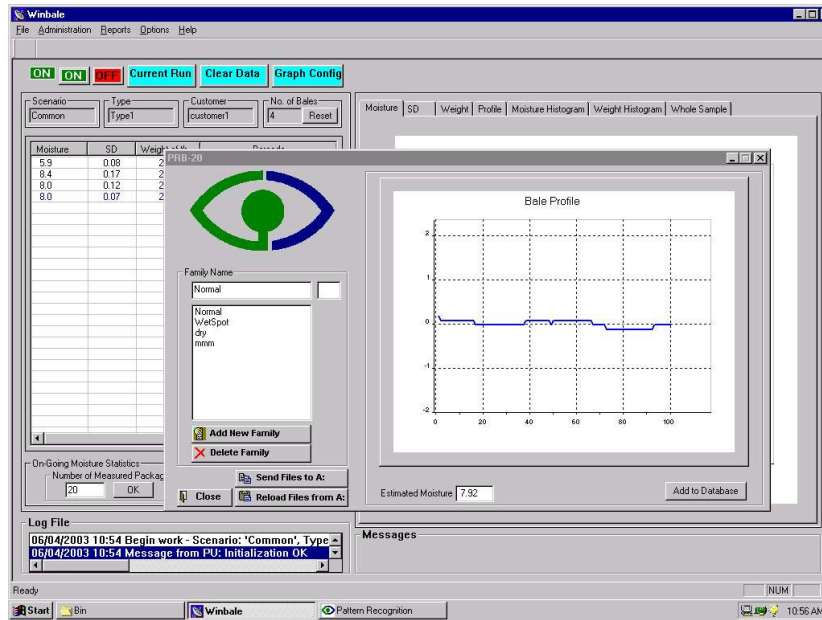
Scenario Settings Screen

Check the PRB box option in order to activate the PRB software for the displayed scenario and click the **Save** button. Click the **Close** button to exit from the Scenario Settings screen.

Note: This operation must be performed for every scenario defined in the WinBale system.

Opening the PRB-20 in WinBale

To open the PRB-20 package in WinBale, click the **Pattern Recognition** option in the Options menu or the **ON** button in the WinBale main screen (if the PRB-20 package is defined for the current scenario). The PRB-20 screen will be displayed, as follows:

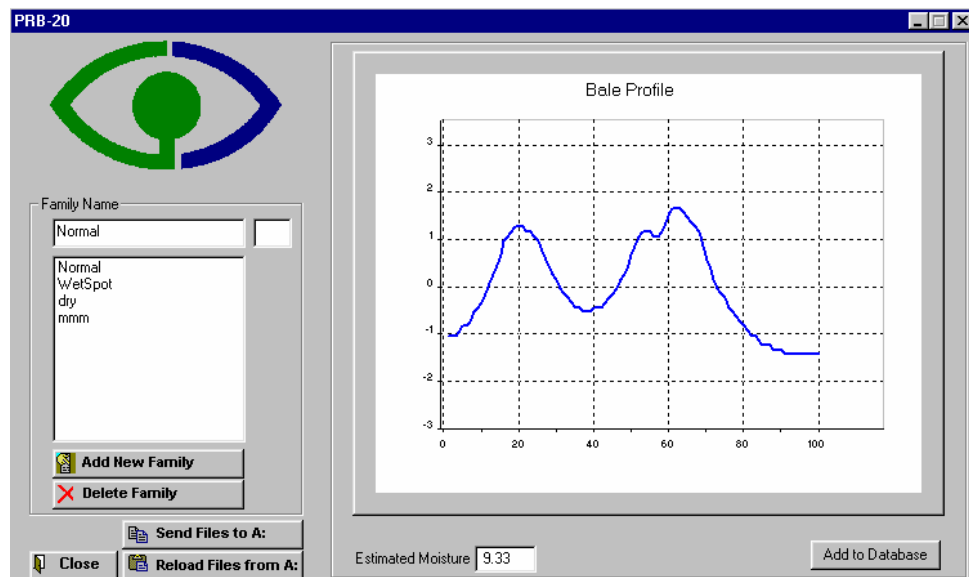


PRB Screen in WinBale

When the PRB-20 window is minimized, the PRB-20 icon will appear in the bottom left-hand area of the screen.

Operations in PRB-20 Screen

All the following operations are performed from the PRB-20 screen, which appears as follows:



PRB-20 Operation