PickByLight System Documentation
Wire Picking Management Platform

System Documentation

Contents

1 Introduction

The PickByLight System is a comprehensive platform designed to manage wire picking operations for automotive manufacturing. The system utilizes a pick-by-light approach to guide operators through the material selection process for different car models. The platform features role-based access control with four distinct user roles: Administrator, PPE (Production Planning Engineer), Team Supervisor, and Operator.

2 System Overview

2.1 Core Functionality

The PickByLight system provides the following key functionalities:

- **Workstation Management**: Configuration and monitoring of Raspberry Pi-based picking workstations
- **Material Configuration**: Setup of materials and picking sequences for different car models
- **Picked Cars Tracking**: Historical tracking of materials picked for specific vehicles
- **User Management**: Role-based access control and user administration
- **Audit Logging**: System activity tracking for accountability and troubleshooting

3 User Authentication

3.1 Login Interface

The system features a secure login interface where users authenticate using their User ID and password credentials. Upon successful authentication, users are directed to their role-specific dashboard with appropriate access permissions.

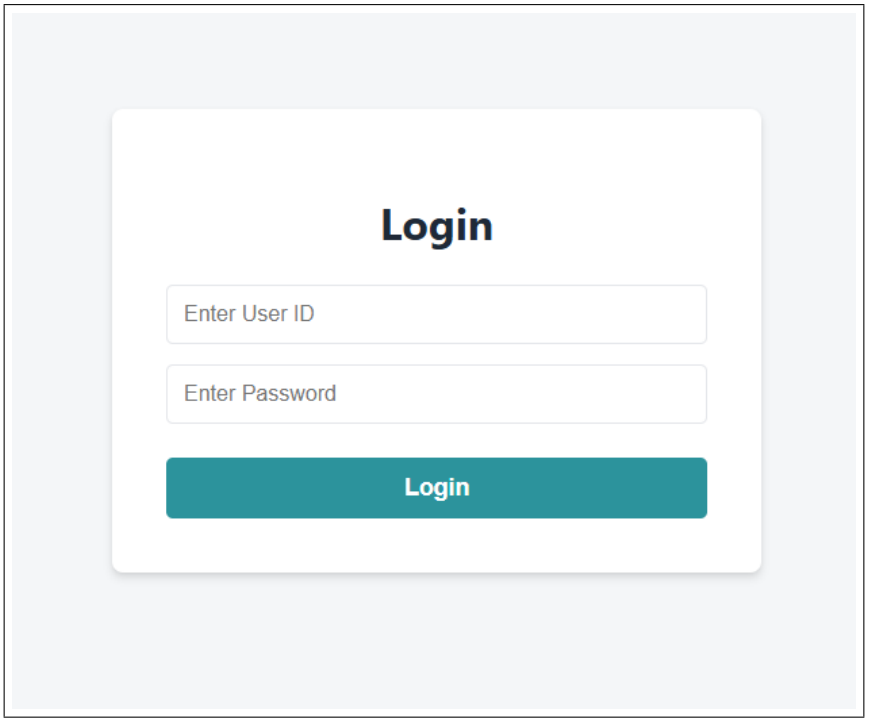

Figure 1: Login Interface - User authentication screen

4 User Roles and Access Control

4.1 Administrator Role

The Administrator has complete system access and is responsible for overall system management, configuration, and user administration. Administrators can access all modules including user management, system configurations, audit logs, and all operational functions.

4.1.1 Admin Dashboard

The administrator dashboard provides access to all system modules through an intuitive card-based interface:

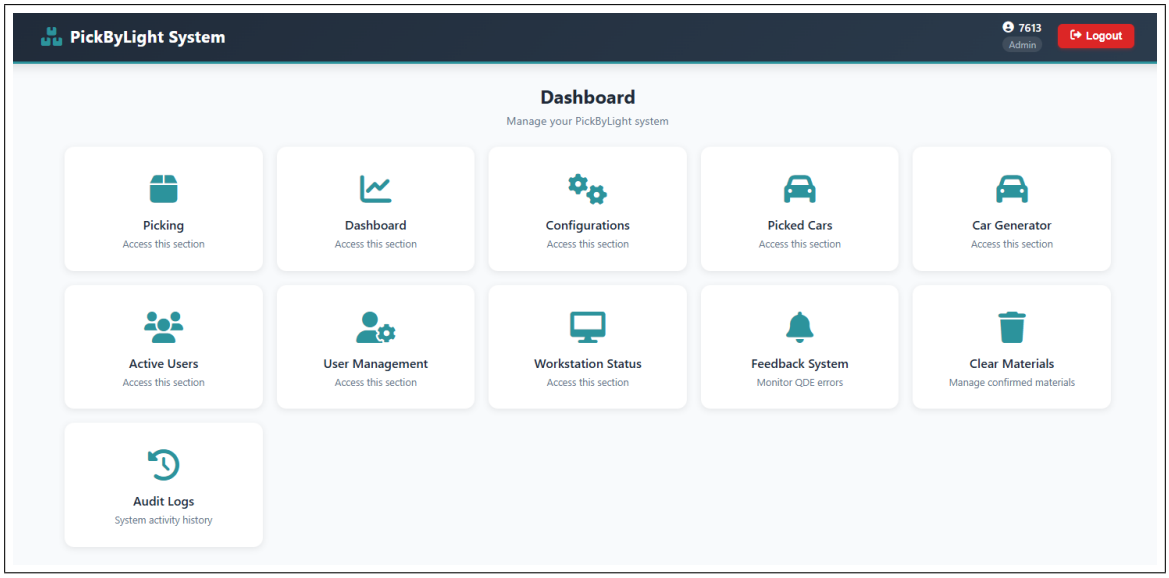

Figure 2: Administrator Dashboard - Full system access with all modules available

Available modules for administrators include:

- **Picking**: Access to the material picking interface
- **Dashboard**: System overview and statistics
- **Configurations**: Workstation and material setup
- **Picked Cars**: Historical picking data
- **Car Generator**: Tool for generating car configurations
- **Active Users**: Monitor currently logged-in users
- **User Management**: Create, modify, and manage user accounts
- **Workstation Status**: Real-time monitoring of workstation health
- **Feedback System**: Monitor QDE (Quality Data Entry) errors
- **Clear Materials**: Manage confirmed materials inventory
- **Audit Logs**: Complete system activity history

4.2 PPE (Production Planning Engineer) Role

The PPE role has restricted access focused on configuration management and picked cars monitoring. This role is designed for production planning personnel who need to configure workstations and review picking history.

4.2.1 PPE Dashboard

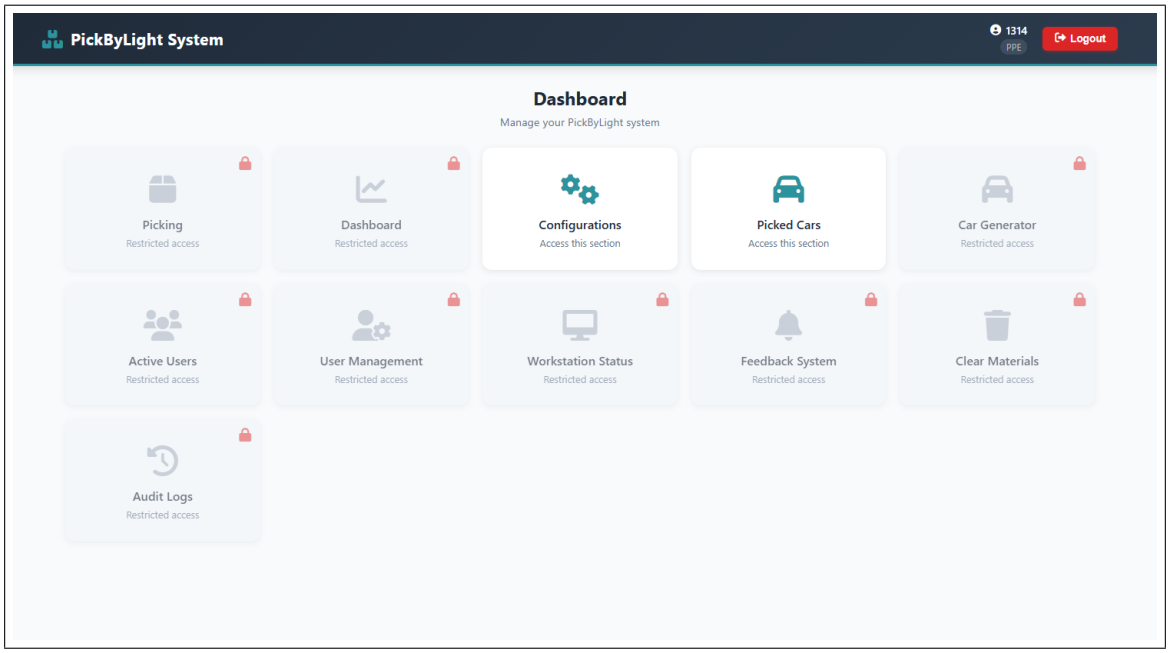

Figure 3: PPE Dashboard - Restricted access showing locked modules

PPE users have access to:

- **Configurations**: Full access to configure workstations and materials
- **Picked Cars**: View historical picking data

Restricted modules (indicated by lock icons):

- Picking interface
- Dashboard statistics
- Car Generator
- Active Users
- User Management
- Workstation Status
- Feedback System
- Clear Materials
- Audit Logs

4.3 Team Supervisor Role

Team supervisors have access to operational modules for monitoring picking activities, workstation status, and managing feedback from the production floor.

4.4 Operator Role

Operators have the most restricted access, limited to the picking interface where they perform material selection tasks guided by the pick-by-light system. The operator's primary responsibility is to:

- Scan or enter vehicle identification numbers
- Follow the pick-by-light visual guidance
- Select materials from illuminated locations
- Confirm picks by pressing the corresponding buttons
- Ensure accurate material selection for each vehicle

The operator interface (detailed in Section 5) is designed for simplicity and efficiency, minimizing distractions and focusing solely on the picking task at hand.

5 Configuration Management

5.1 Workstation Configuration Overview

The configuration management module allows authorized users (Admin and PPE) to create and manage workstation configurations. Each workstation is associated with a Raspberry Pi device that controls the pick-by-light indicators.

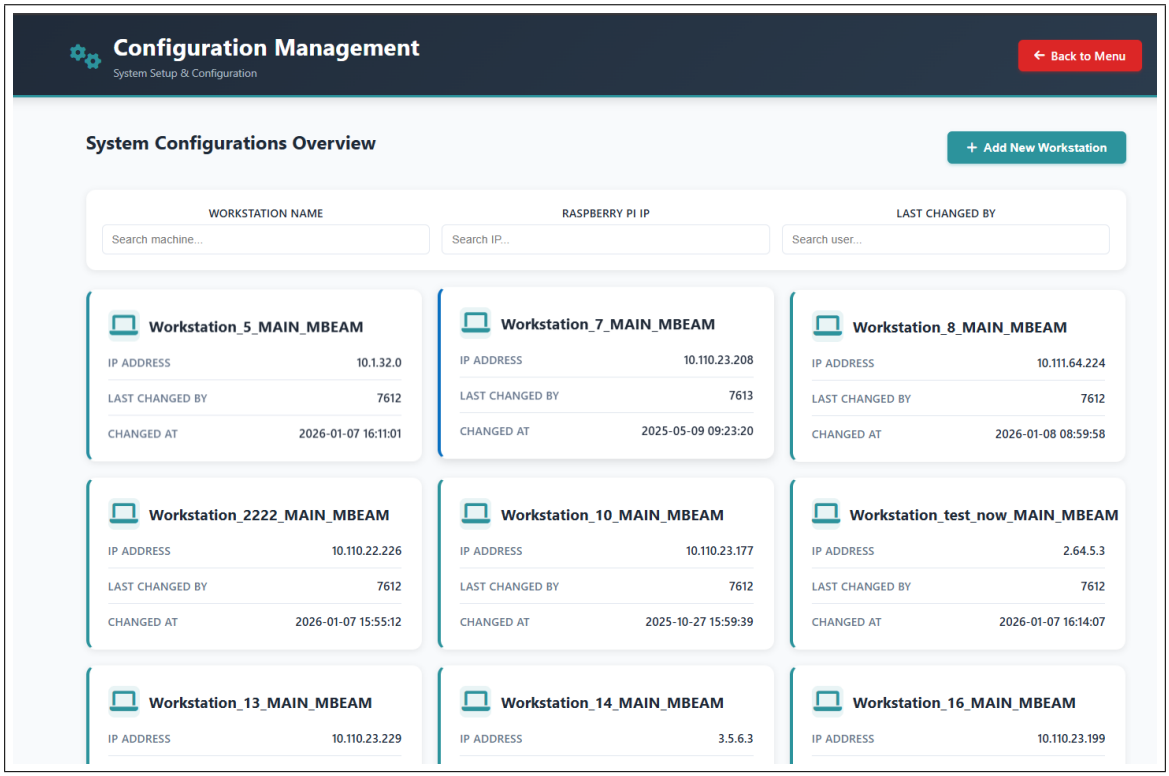

Figure 4: System Configurations Overview - Display of all configured workstations

The configuration overview displays:

- **Workstation Name**: Unique identifier for each picking station

- **Raspberry Pi IP**: Network address of the control device
- **Last Changed By**: User ID of the person who last modified the configuration
- **Changed At**: Timestamp of the last modification

Key features:

- Search functionality for workstation names, IP addresses, and users
- Grid view of all workstations
- "Add New Workstation" button for creating new configurations

5.2 Creating a New Workstation Configuration

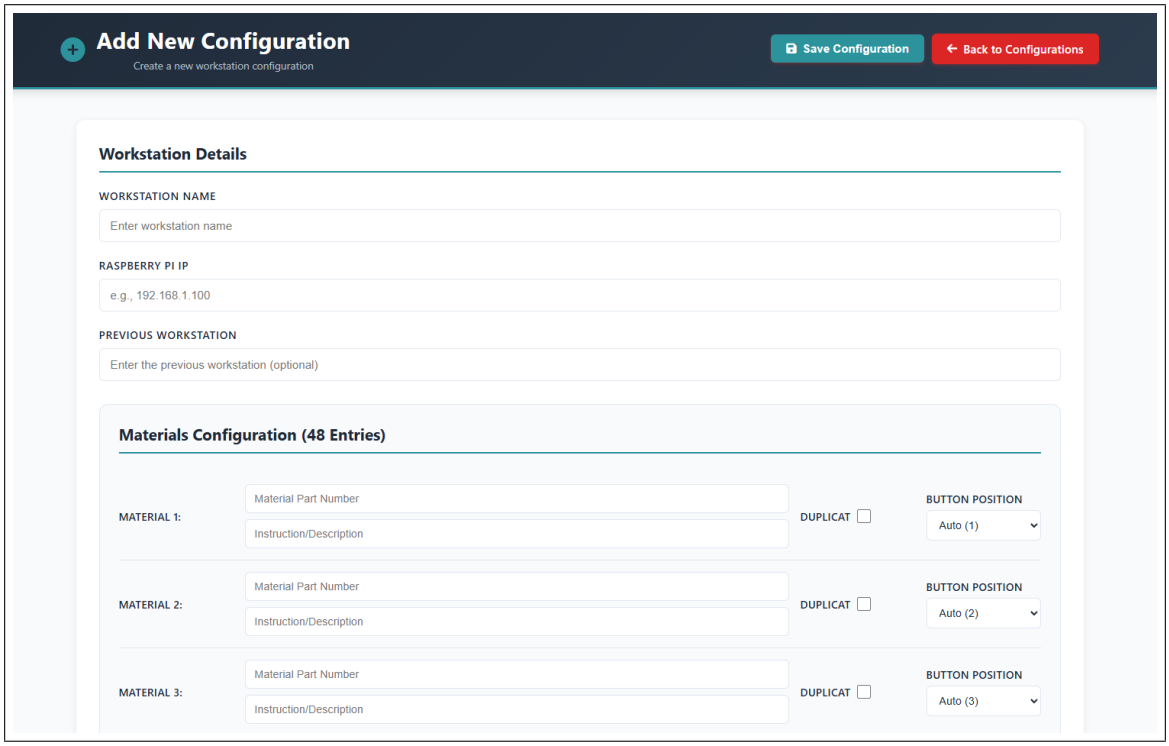

Figure 5: Add New Configuration - Workstation setup interface

When creating a new workstation configuration, users must provide:

5.2.1 Workstation Details

- **Workstation Name**: A unique identifier for the picking station
- **Raspberry Pi IP**: The network IP address of the Raspberry Pi controller
- **Previous Workstation**: Optional field to link to a previous station in the workflow

5.2.2 Materials Configuration

The system supports configuration of 48 material entries (expandable), with each material slot containing:

- **Material Part Number**: The unique identifier for the wire/component
- **Instruction/Description**: Additional information or picking instructions
- **Duplicate Checkbox**: Indicates if multiple units of the same material are needed
- **Button Position**: Physical location mapping (Auto 1, Auto 2, Auto 3, etc.) corresponding to the pick-by-light button positions at the workstation

This configuration ensures that when a specific car model arrives at the workstation, the correct materials are illuminated in the proper sequence based on the car's bill of materials.

6 Picking Interface

6.1 Operator Picking View

The picking interface is the core operational component of the PickByLight system, used by operators to select wires and materials for specific vehicles. This interface provides a visual representation of the wire that needs to be picked and guides the operator through the picking process.

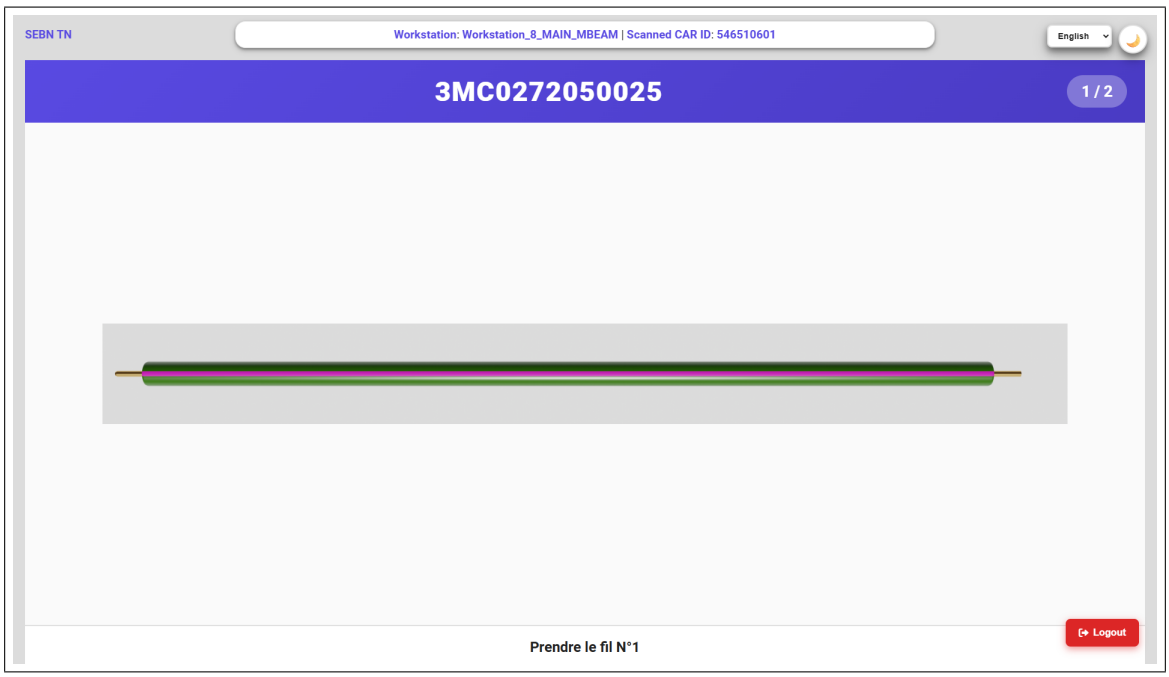

Figure 6: Picking Interface - Wire selection view for operators

6.1.1 Interface Components

The picking interface displays the following information:

- **Workstation Identification**: Shows the current workstation name (e.g., "Workstation_8_MAIN_MBEAM")
- **Scanned Car ID**: Displays the vehicle identification number currently being processed (e.g., "546510601")
- **Material Part Number**: Large, prominent display of the wire/material part number to be picked (e.g., "3MC0272050025")

- **Progress Indicator**: Shows picking progress (e.g., "1 / 2" indicating first of two materials)
- **Visual Wire Representation**: A color-coded illustration of the wire showing its physical appearance with multiple conductor colors
- **Action Prompt**: Instructions in French "Prendre le fil N°1" (Take wire number 1)
- **Language Selection**: Dropdown to switch interface language
- **Light Mode Toggle**: Option to switch between light and dark display modes
- **Logout Button**: Allows operator to end their session

6.1.2 Picking Process Flow

The operator follows this workflow when using the picking interface:

1. A car with a specific ID is scanned or entered into the system
2. The system displays the first material to be picked with its part number
3. The corresponding pick-by-light button illuminates at the physical storage location
4. The operator views the wire illustration on screen to verify visual identification
5. The operator picks the wire from the illuminated location
6. The operator presses the illuminated button to confirm the pick
7. The system records the pick with timestamp and user ID
8. The system automatically advances to the next material (if any)
9. The process repeats until all materials for the car are picked

6.1.3 Visual Wire Identification

The wire illustration provides critical visual information to help operators:

- Identify the correct wire by its color coding
- Distinguish between similar part numbers
- Verify they have selected the correct material before confirming
- Reduce picking errors through visual confirmation

In the example shown, the wire displays multiple conductor colors (pink/magenta band with green outer coating), helping the operator quickly identify the correct wire among many similar options.

6.1.4 Multi-Language Support

The interface supports multiple languages to accommodate diverse workforce:

- Language can be changed via the dropdown in the top-right corner
- All text elements update to the selected language
- Default language appears to be French ("Prendre le fil N°1")
- Ensures accessibility for international operators

7 Picked Cars Module

7.1 Cars Overview

The Picked Cars module provides visibility into the historical picking data, allowing users to track which materials were picked for specific vehicles.

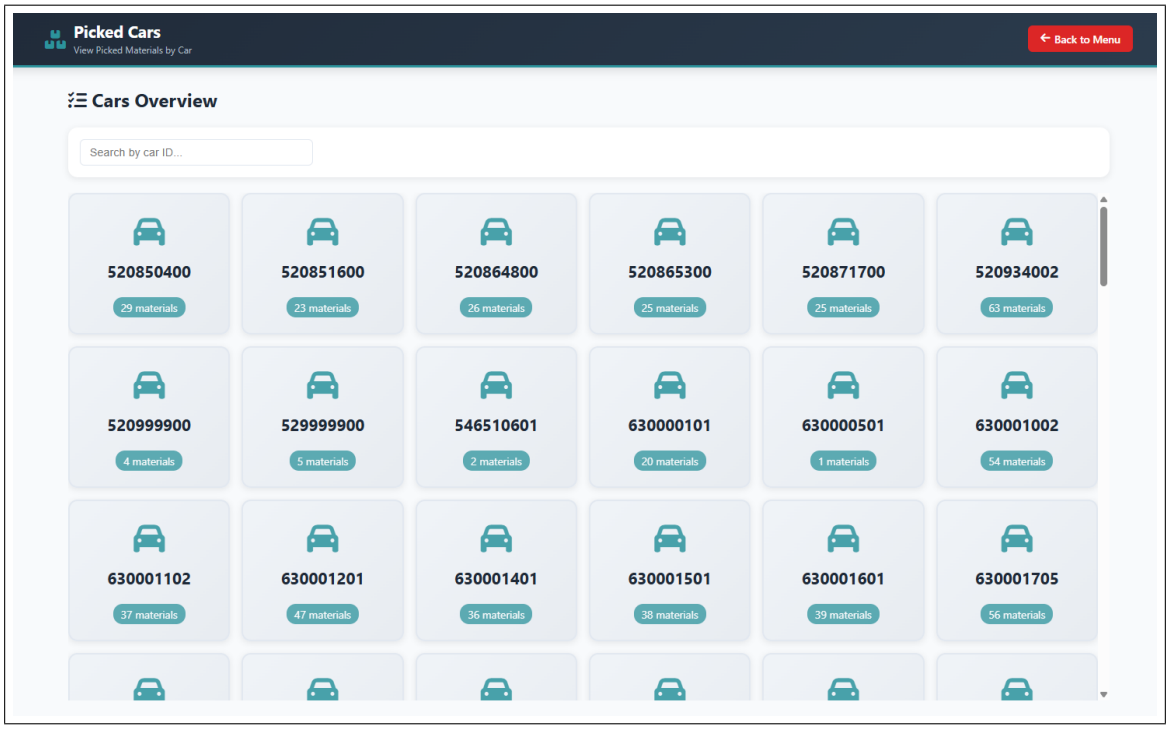

Figure 7: Cars Overview - Grid display of vehicles with picking history

Features include:

- **Car ID Display**: Each card shows a unique vehicle identification number
- **Material Count**: Indicates the number of materials picked for each car
- **Search Functionality**: Quick search by car ID
- **Grid Layout**: Visual organization of all processed vehicles

7.2 Material Details for Specific Car

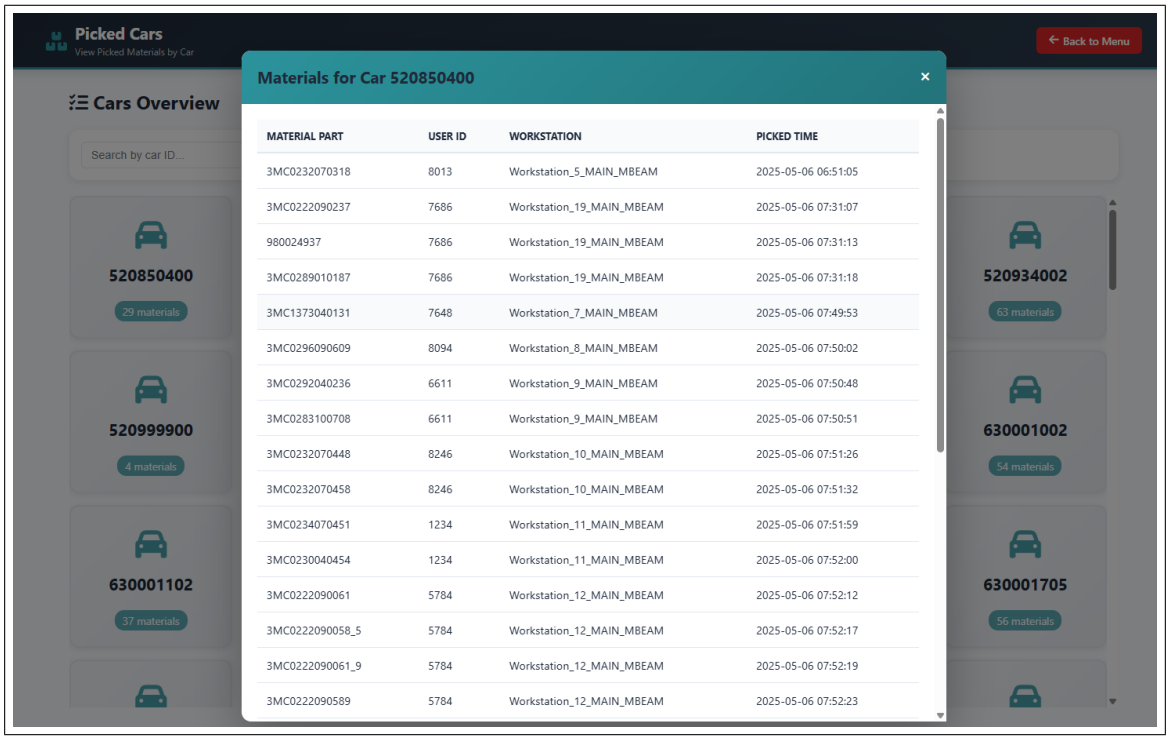

Figure 8: Materials for Car 520850400 - Detailed picking history

When selecting a specific car, users can view comprehensive picking details:

- **Material Part Number**: The specific wire or component picked
- **User ID**: Operator who performed the picking operation
- **Workstation**: The station where the material was picked
- **Picked Time**: Timestamp of when the material was selected

This information is crucial for:

- Quality tracking and traceability
- Performance monitoring
- Identifying picking errors or anomalies
- Audit compliance
- Process optimization

8 System Workflow

8.1 Typical Picking Process

1. **Configuration Setup**: PPE or Admin configures workstations with material lists and button positions
2. **Operator Login**: Operator logs into the system and accesses the picking interface

3. **Car Entry**: A vehicle with a specific ID enters the production line and is scanned
4. **System Recognition**: The system identifies the car and retrieves its material requirements
5. **Display Material**: The picking interface displays the first material part number with visual wire illustration
6. **Light Activation**: At the workstation, the pick-by-light system illuminates the button corresponding to the required material's physical location
7. **Visual Verification**: The operator views the on-screen wire illustration to visually confirm the correct wire
8. **Material Selection**: The operator physically picks the wire from the illuminated location
9. **Confirmation**: The operator presses the illuminated button to confirm the pick
10. **Data Recording**: The system records the pick with material ID, user ID, workstation, and timestamp
11. **Next Material**: The system automatically advances to the next required material (if any)
12. **Completion**: Once all materials are picked, the car moves to the next workstation or production stage
13. **Historical Storage**: All picking data is stored for later review and analysis

8.2 Multi-Workstation Flow

The system supports sequential workstation configurations where:

- A car progresses through multiple picking stations
- Each station has specific materials configured
- The "Previous Workstation" field links stations in sequence
- Materials are picked in a defined order across stations

9 Security and Audit Features

9.1 Role-Based Access Control

The system implements strict role-based access control:

- Each user is assigned a specific role (Admin, PPE, Team Supervisor, or Operator)
- Dashboard modules are locked or unlocked based on role permissions
- Lock icons visually indicate restricted access
- Unauthorized access attempts are logged

9.2 Audit Logging

The system maintains comprehensive audit logs including:

- User login/logout events
- Configuration changes with user attribution
- Picking operations with timestamps
- System access attempts
- Data modifications

10 Technical Architecture

10.1 Hardware Components

- **Raspberry Pi Controllers**: One per workstation, controlling pick-by-light buttons
- **Pick-by-Light Buttons**: Physical buttons with integrated LEDs at material locations
- **Network Infrastructure**: TCP/IP network connecting all workstations to central server

10.2 Software Components

- **Web-Based Interface**: Accessible through modern web browsers
- **Database Backend**: Stores configurations, picking history, and user data
- **Real-Time Communication**: Interfaces with Raspberry Pi controllers
- **Authentication System**: Manages user credentials and sessions

11 Conclusion

The PickByLight System provides a robust, role-based platform for managing wire picking operations in automotive manufacturing. Through its intuitive interface, comprehensive configuration capabilities, and detailed tracking features, the system ensures accurate material selection while maintaining full traceability and accountability throughout the picking process.