JIANGXI KMAX INDUSTRIAL CO., LTD.

VR Software for Practical Training on Maintenance of Construction Machinery Engine

PRODUCT INTRODUCTION

Content

1. Product Overview

VR Software for Practical Training on Maintenance of Construction Machinery Engine is a practical teaching product designed and developed for secondary vocational, higher vocational, and application-oriented undergraduate colleges to assist in engineering machinery teaching. This software is based on the Cummins 6CT engine and is modeled 1:1 according to the actual engine structure. The software adopts the most advanced VR virtual simulation technology, which simulates the principle demonstration of core components such as disassembly and assembly of engineering machinery engines and engine measurement through real data collection and university research. Students can complete the entire simulation training process through virtual scenes, achieving a perfect combination of theoretical and practical teaching.

2. Target Audience

The target users of this software are teachers and students in the construction machinery-related majors of community colleges, technical colleges and universities.

3. Compatible Devices

KMAX desktop VR All-In-One machine or PC.

4. Product Value

This VR teaching and training software effectively addresses the following pain points in the educational process of colleges and universities:

- **Comprehensive Teaching and Training:** The software not only covers theoretical knowledge points found in professional materials but also includes practical training Works related to the disassembly and assembly of wet-drive axles, dry axles, and manual transmissions. This helps make the training phase of teaching more efficient.
- **Standardized and Professional Training:** It strictly follows standardized operating procedures and the repair manual processes provided by manufacturers, ensuring the professionalism and standardization of teaching and training.
- **Highly Realistic 3D Modeling:** The model resources are based on the structure of a loader and are precisely modeled at a 1:1 scale according to the dimensions of each component, providing a highly realistic representation.
- **Enhanced Learning Assessment:** In traditional teaching, it is difficult for teachers to accurately collect the information of students knowledge acquisition. Practical training with real vehicles is often limited to fixed training points and specific vehicles.

The VR training software overcomes these limitations, allowing for more flexible and comprehensive assessment of students' learning progress.

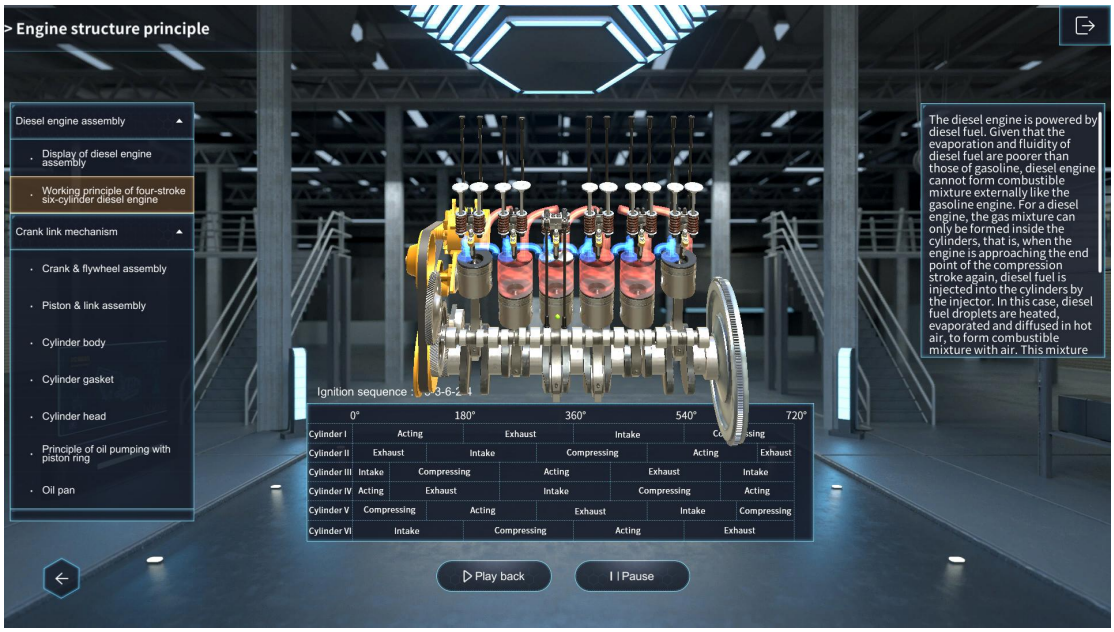
5. Content List

Module	Mode	Specific Content	Presentation Form
Structural Principles	Cognitive Learning	Diesel engine assembly, Crank link mechanism, Valve mechanism, Cooling system, Engine oil supply system, Fuel system, Power supply and start system	Text Description, Model Display, Principle Animation
Disassembly Training	Practical Training	Disassembly of Engine	Interactive Practical, Training Exercises
Assembly Training		Assembly of Engine	
Measurement Training		Measurement of cam shaft thrust clearance	
Fault Diagnosis		Over-temperature of engine coolant due to loose excavator engine belt, Engine oil burning due to damage to loader oil ring, Powerless engine due to inadequate cylinder pressure of excavator, Inadequate engine oil pressure due to wear in excavator engine oil pump, Engine shaking due to lack of cylinder operation of excavator engine	

6. Functionality Introduction

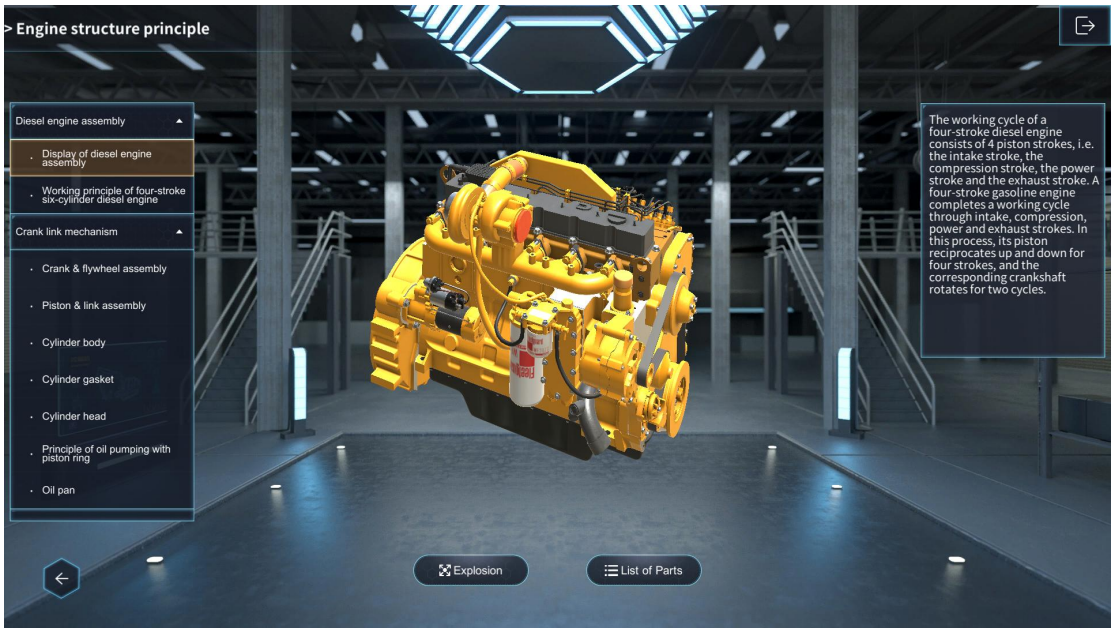
6.1. Structural Principles

On the principles of engine structure, the left side shows the module classification of the engine system. Click on the first level menu and scroll down to expand the second level menu. Click the "Back" button in the bottom left corner to return to the homepage. The text description of the displayed model will be displayed in the prompt box on the right. Click the "Play" button on the page to play the corresponding principle animation of the model.

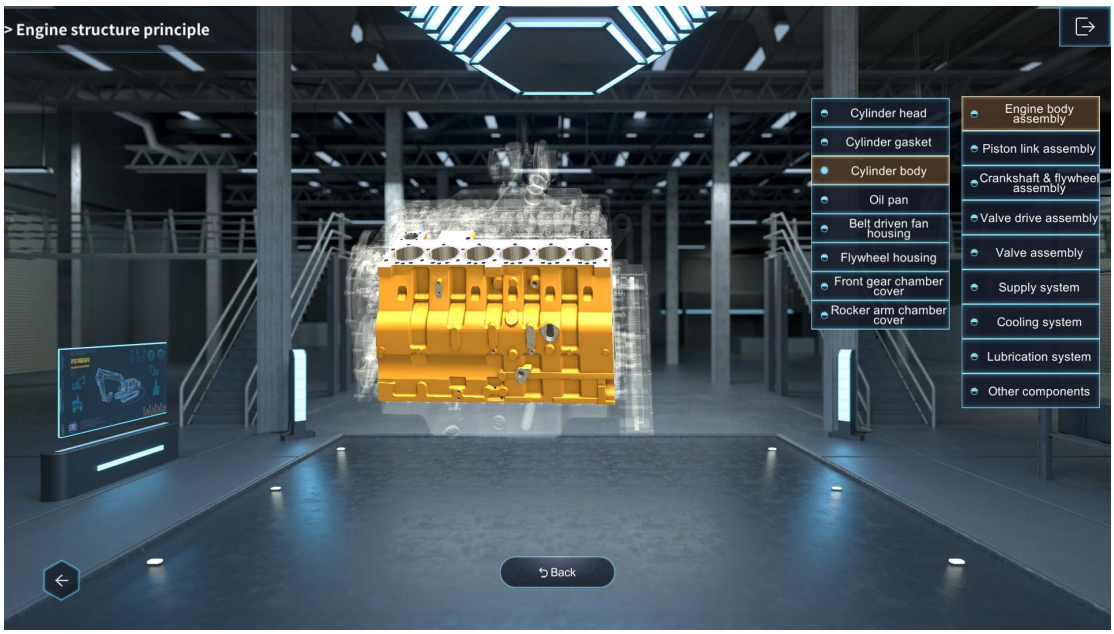


Clicking on the left menu bar allows users to switch between the structural principle displays of different components. Holding the middle button of the stylus enables users to drag the slider at the bottom of the scene, thereby playing the interactive animation between the model and the UI.

Click on the second level menu "Diesel Engine Assembly Display" to provide an overall overview of the engine display. Click on the "List of Parts" at the bottom to access detailed model introductions of various engine components.



The first column on the right is the primary menu, click to expand the secondary menu in the second column on the right. Each model or component is presented in three ways: entire, semi transparent, and hidden. The three display modes can be switched by clicking on the dots at the front of the model and component. Click the "Back" button at the bottom to return to the "Diesel Engine Assembly Display" interface.

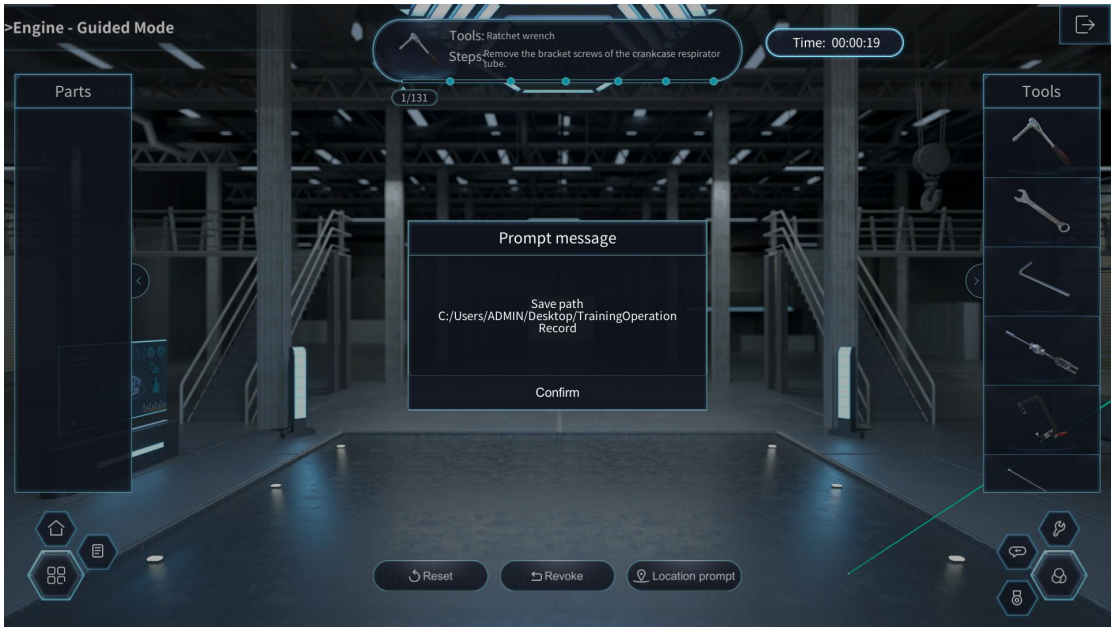


6.2. Disassembly and Assembly Training

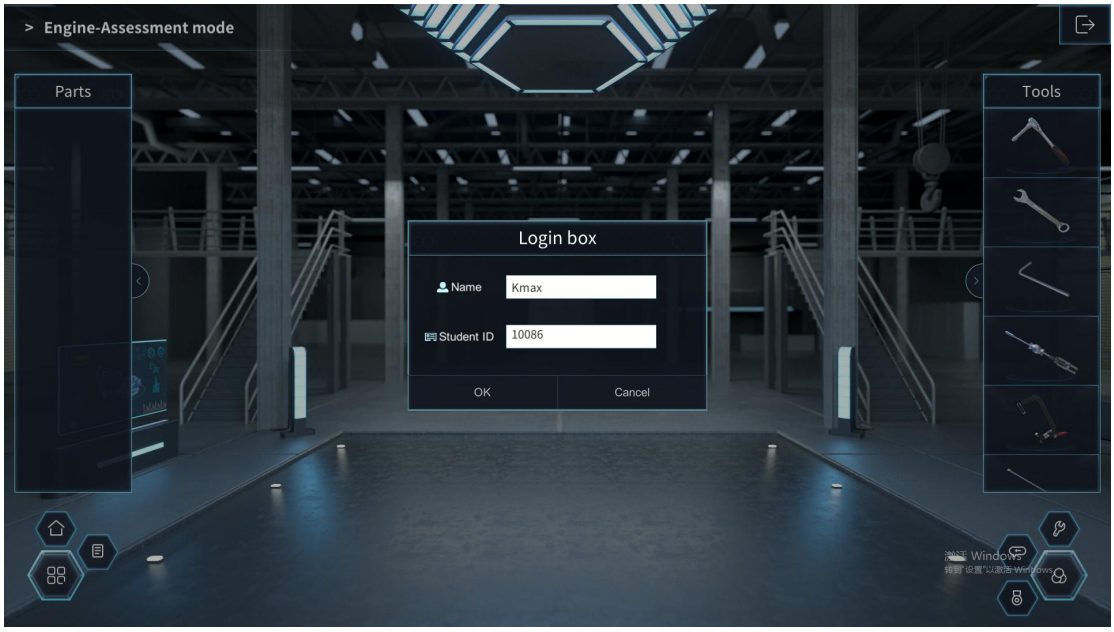
After clicking on "Practical Training on Removal", enter the disassembly training scene. Click the "Back" button to return to the homepage. After entering the disassembly training scenario, the top of the page displays text prompts for the operation steps and the number of steps taken. At the bottom of the page are buttons for "Reset", "Revoke", and "Location Prompt". Click "Reset" to return the model to its initial state; Click "Revoke" to return to the previous step when disassembling the model; Click on "Location Prompt", and the required tool parts and operating points for this step will be highlighted in the scene. On the left is the parts column, where you can click to select a part. On the right is the toolbar, where you can click to select the necessary tools for disassembly and assembly. Click on the semi-circular arrows on both sides to control the telescopic parts bar and toolbar. Click the circular button on the progress bar to jump to the next step.

The bottom left corner expands to reveal “Back” and “Record” buttons.Clicking “Back” takes users back to the disassembly transition page. Clicking the “Record” button brings up the Work records for the current task.

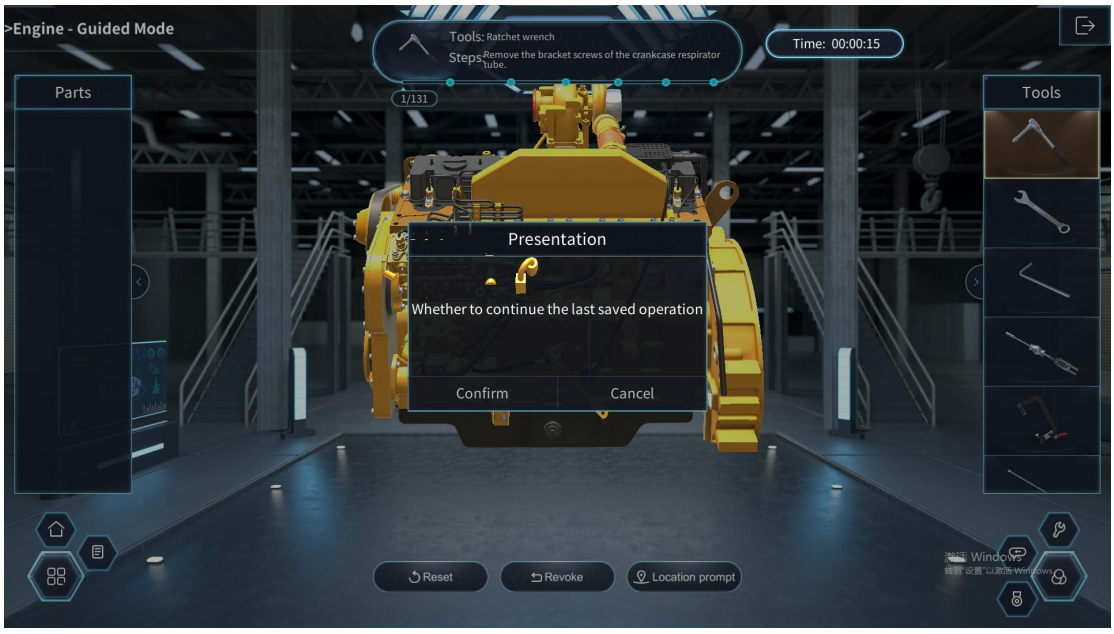
Clicking the "Export" button allows users to export the Work records in PDF format to the local desktop folder.



The bottom right corner expands to reveal “Guide”“Training” and “Assessment” buttons. Clicking these buttons allows users to switch between Guidance Mode, Training Mode, and Assessment Mode. In Guidance Mode, the tool parts and Work locations are automatically prompted. In Training Mode, users need to manually click the “Location Prompt” button to prompt the tool parts and Work locations. In Assessment Mode, the name and student number of the person being assessed must be entered, and all hint functions are disabled while the Work timing function is activated.



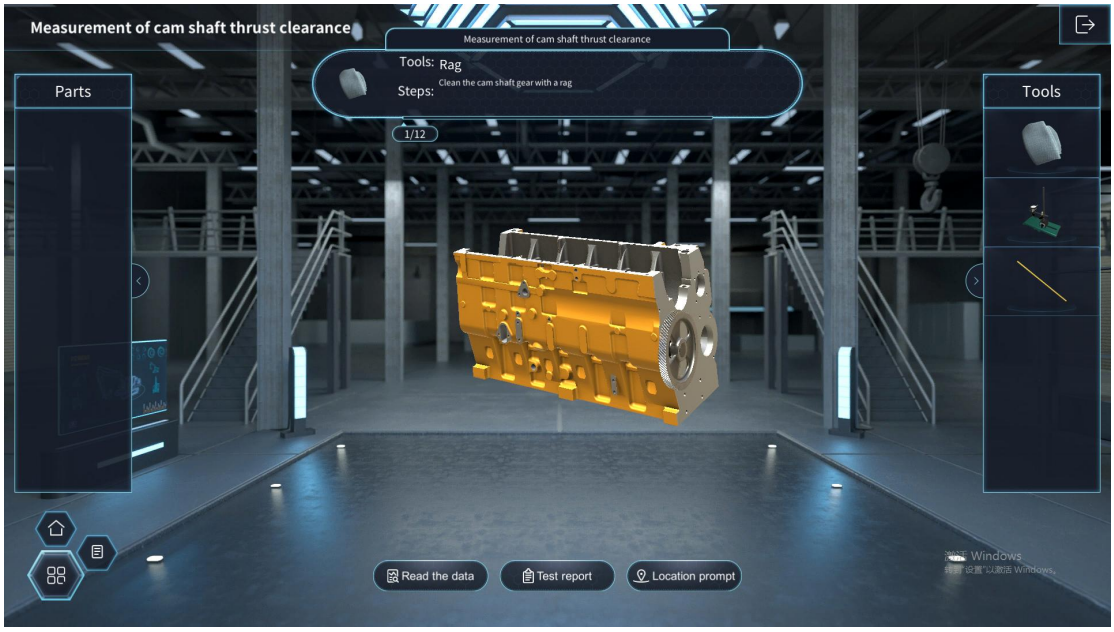
After exiting the current mode and entering again, the software will ask if you want to continue with the last operation



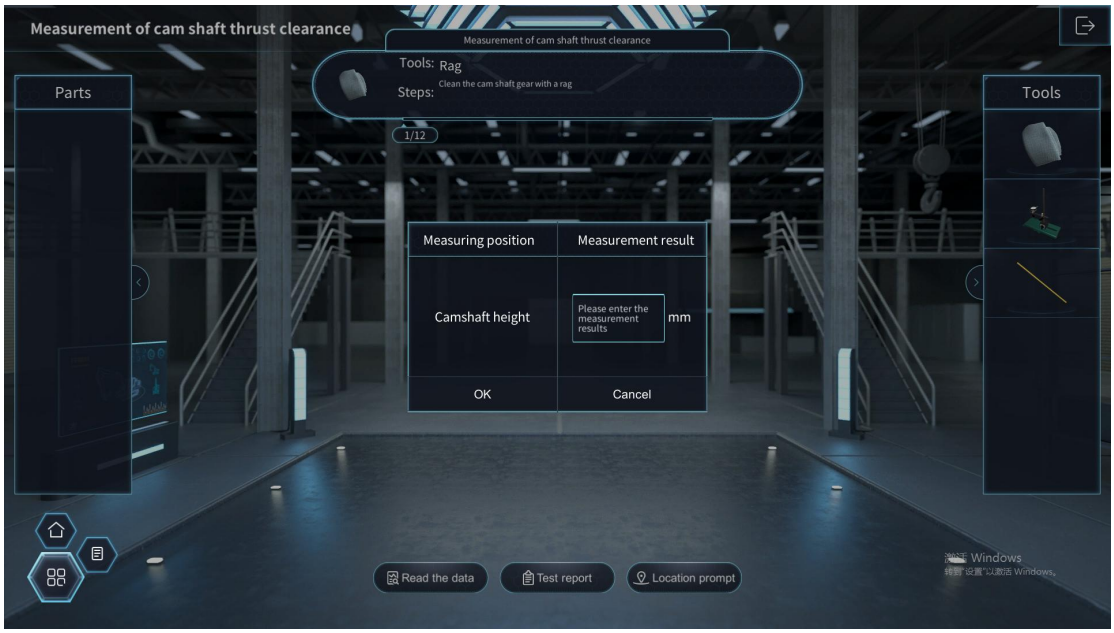
6.3. Measurement Training

After clicking on "Measurement Training" on the homepage, enter the engine measurement scene. After entering the engine measurement scene, the top of the page displays text prompts for the operation steps, the number of steps, and the name of the current measurement task. At the bottom of the page are buttons for "Read Data",

"Test Report", and "Location Prompt". Click on "Location Prompt", and the required tool parts and operating points for this step will be highlighted in the scene. On the left is the parts column, where you can click to select a part. On the right is the toolbar, where you can click to select the necessary tools for disassembly and assembly. Click on the semi-circular arrows on both sides to control the telescopic parts bar and toolbar.

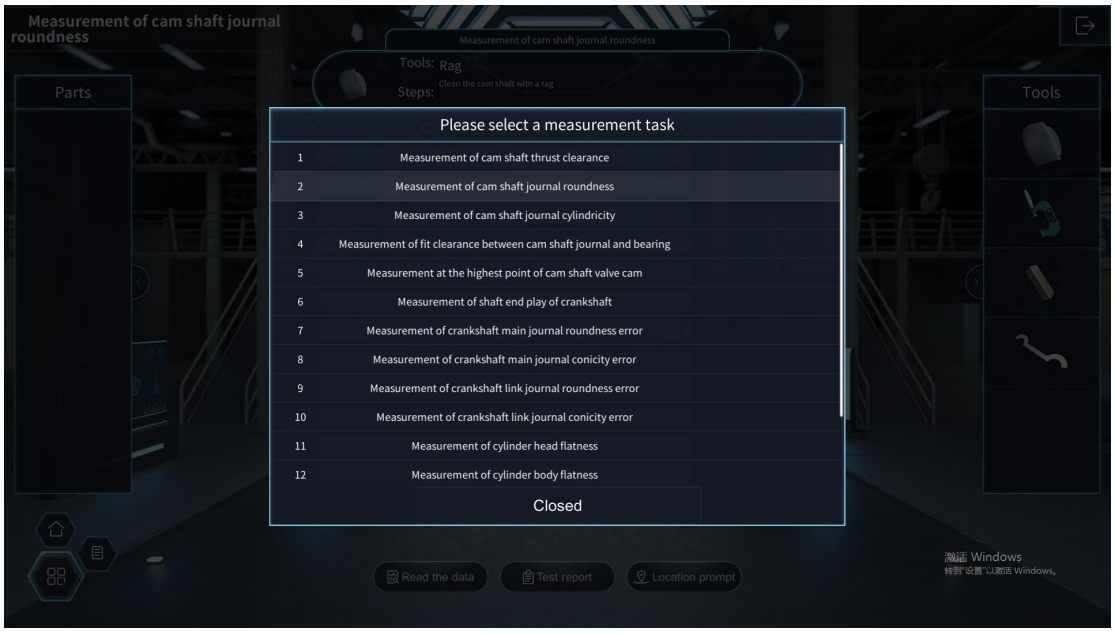


Click on "Read the Date" to bring up a data recording box, where you can record the measurement results of the current step.



Click on "Test Report" to bring up the test report, where you can fill in the final test data for the current task.

The bottom left corner is expanded to display the "Back" and "Task" buttons. Click the "Back" button to return to the homepage. Click the "Task" button to bring up a list of 15 engine measurement tasks, where you can select a measurement task.

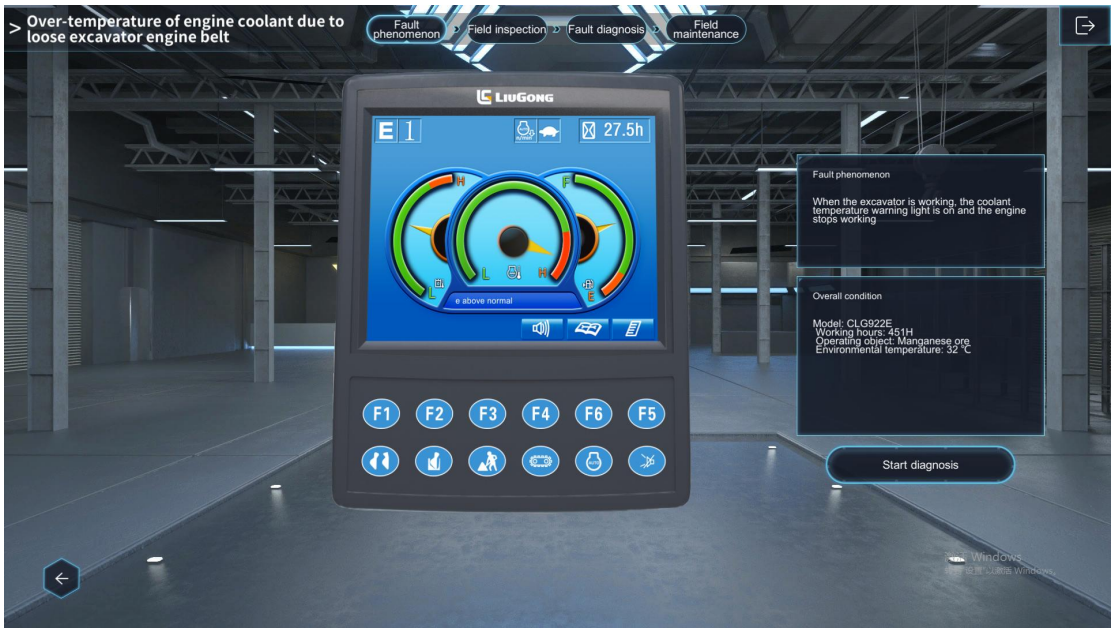


6.4. Fault Training

After clicking on "Fault Diagnosis", users will enter the transition interface for fault diagnosis, where users can select the fault diagnosis tasks. The software includes a total of 5 fault points. Clicking the "Back" button will take users back to the homepage.

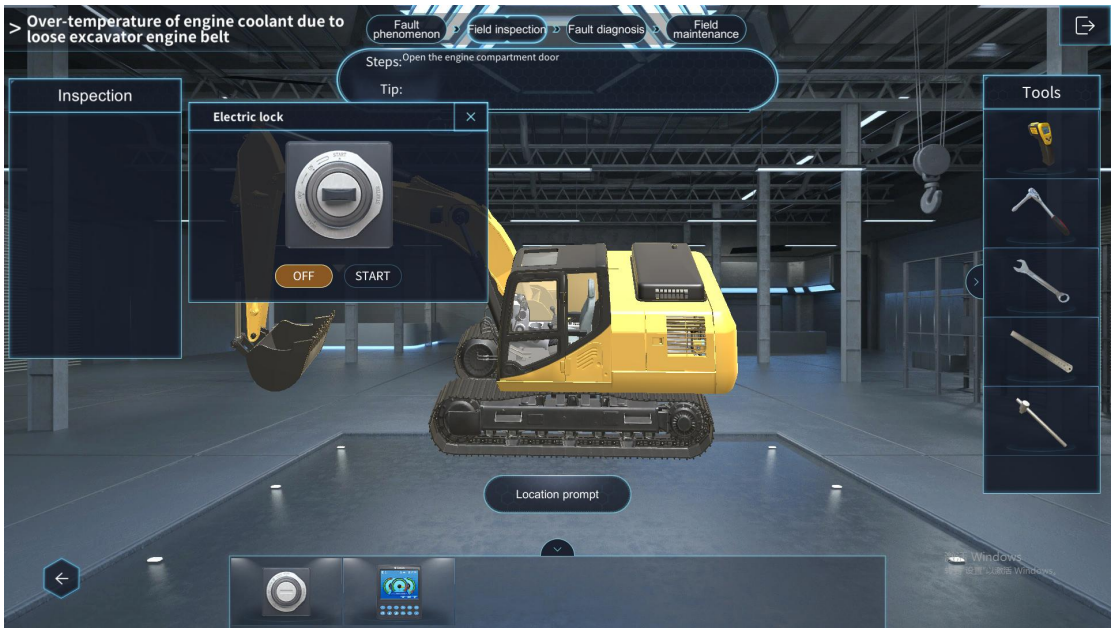
6.4.1. Over-Temperature of Engine Coolant due to Loose Excavator Engine Belt

Fault diagnosis is divided into four steps: fault symptoms, on-site inspection, fault diagnosis, and on-site maintenance.

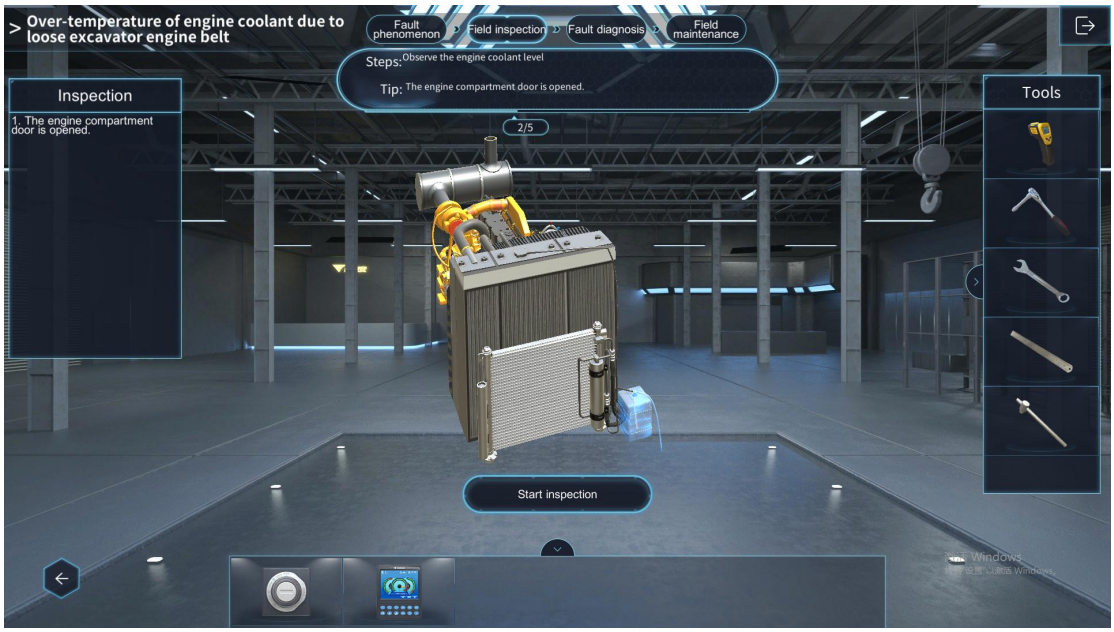


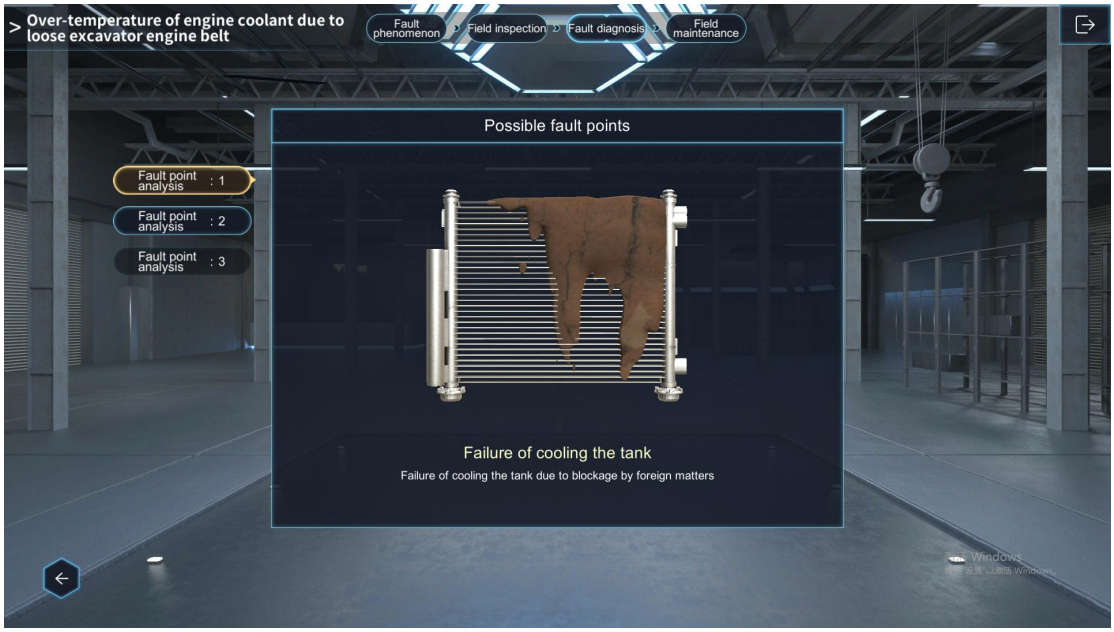
After entering the fault symptom scene, the top of the page indicates the current process location. The middle section displays the fault symptom, while the text box on the right shows a description of the fault symptom and the overall machine condition. The bottom left corner of the page features a "Back" button, which allows users to go back to the fault diagnosis transition interface. There is also a "Start Diagnosis" button at the bottom right of the page; clicking it takes users to the next step.

The next step is the on-site inspection scene,as shown in the figure below:

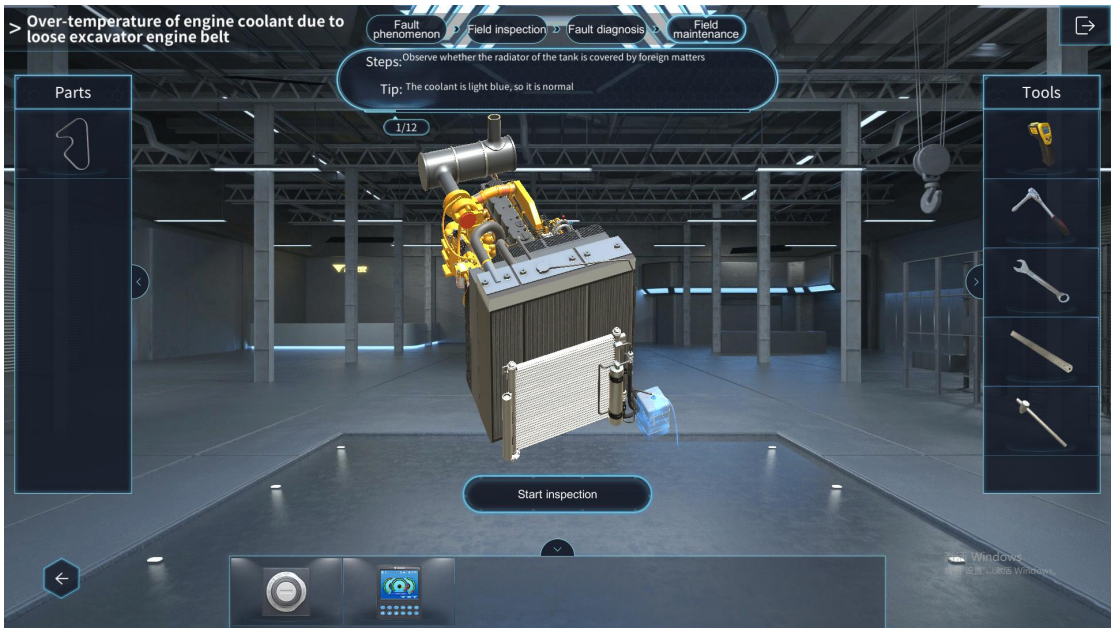


The middle of the page displays the entire machine or the relevant components; the top of the page shows text prompts for Workable steps and the step count. The bottom of the page features a "Start Failure Analysis" button and a switch Work bar. Clicking the "Start Failure Analysis" button displays the optimal view for the current Work. Clicking the switch components in the switch Work bar opens the corresponding switch UI for further Works. The text box on the left side of the page shows the inspection result, summarizing the text results of all previous inspection steps. The right side of the page is the toolbar, where users can click to use tools for further inspection of the components. After completing all inspection steps, a "Start Fault Analysis" button will appear. Clicking it takes users to the fault analysis scene, as shown in the figure below:





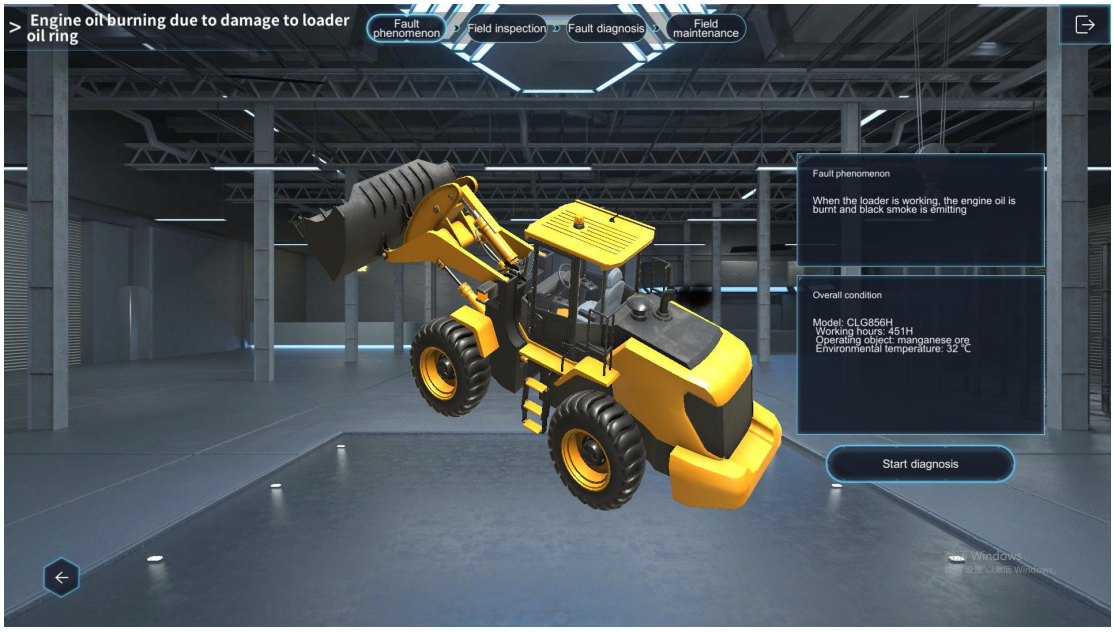
After entering the fault diagnosis scenario, the display and text description of possible fault causes are in the middle of the page. Click to enter the schematic display page. On the left side of the page is the selection of possible causes of faults. Click to switch between possible fault causes. After viewing all fault causes, the "Start Inspection" button will appear at the bottom of the page. Click to enter the on-site repair scenario.

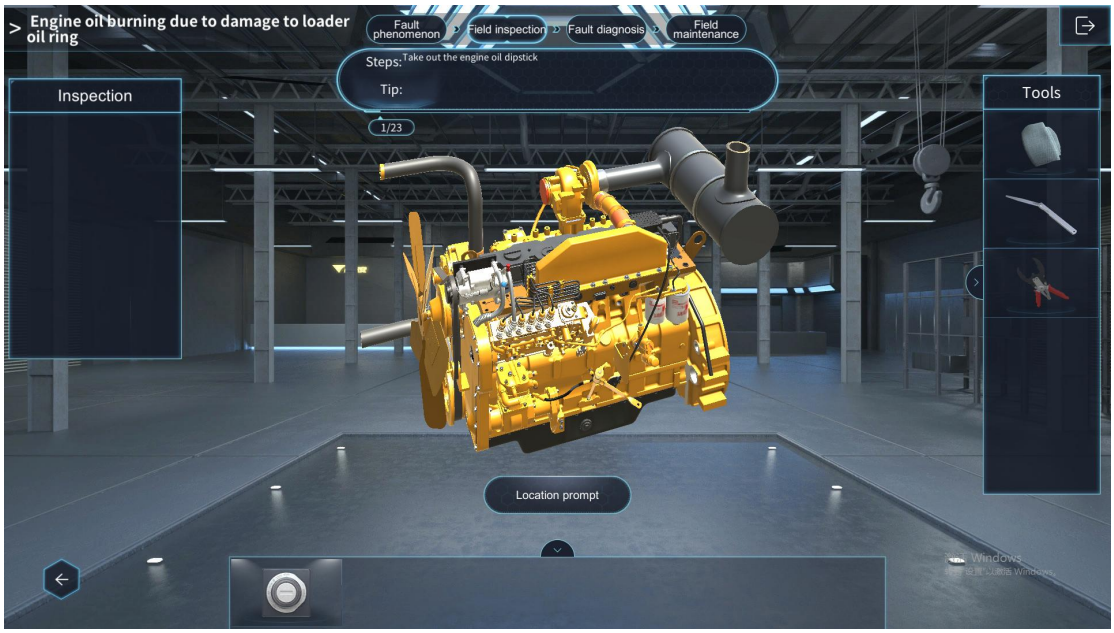


After entering the on-site repair scene, the middle of the page displays models of the relevant entire machine or components. The left side of the page is the parts bar, where users can click to select parts for repair Works. The top of the page shows text prompts for Workable steps and the step count.

The bottom of the page features a "Location Prompt" button and a switch Work bar. Clicking the "Location Prompt" button displays the optimal view for the current Work. Clicking the switch components in the switch Work bar opens the corresponding switch UI for further Works. The right side of the page is the toolbar, where users can click to use tools to check and confirm the post-repair status of the components.

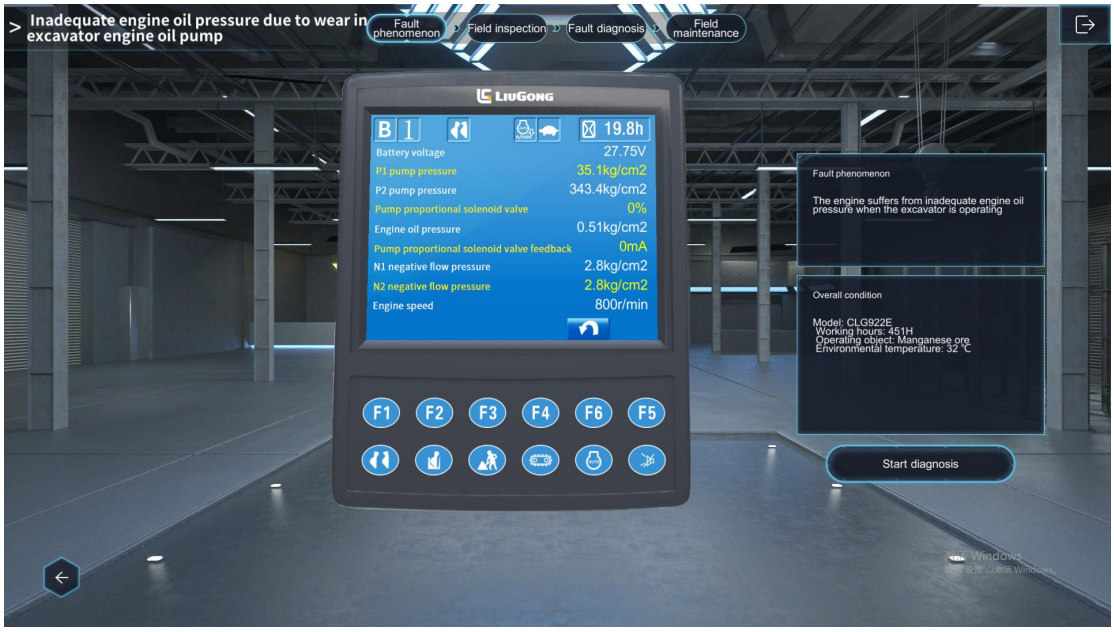
6.4.2. Engine Oil Burning due to Damage to Loader Oil Ring

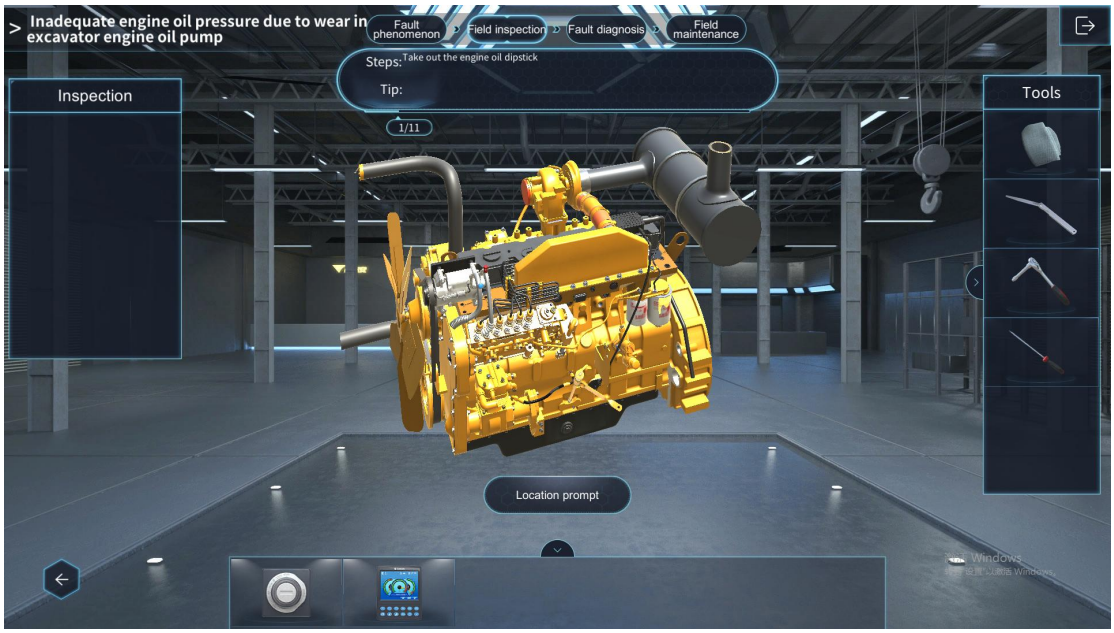




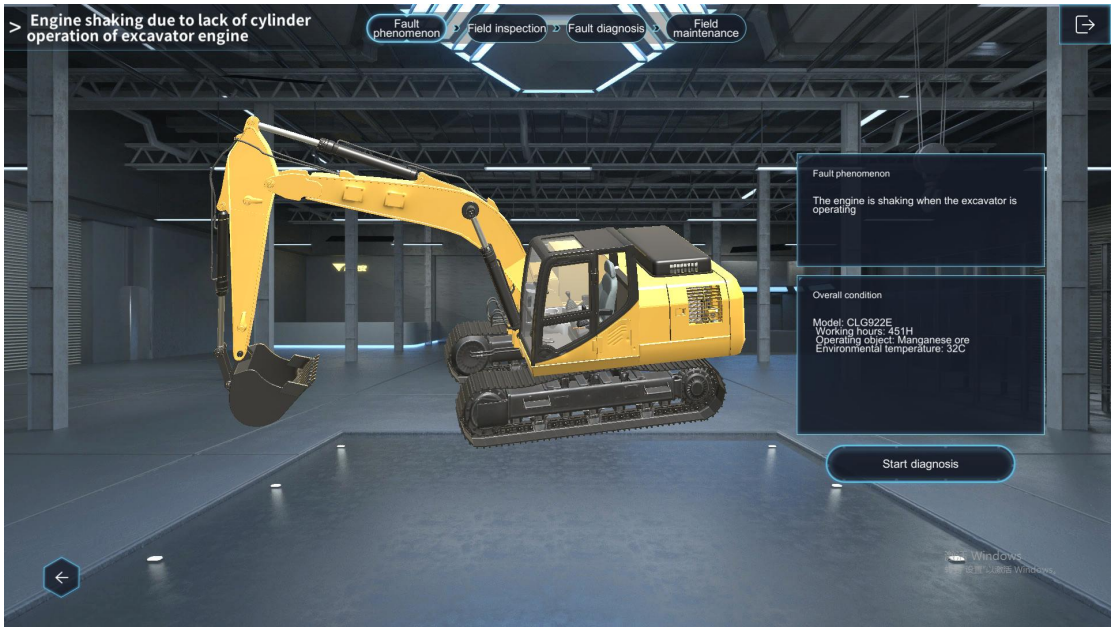
6.4.3. Powerless Engine due to Inadequate Cylinder Pressure of Excavator

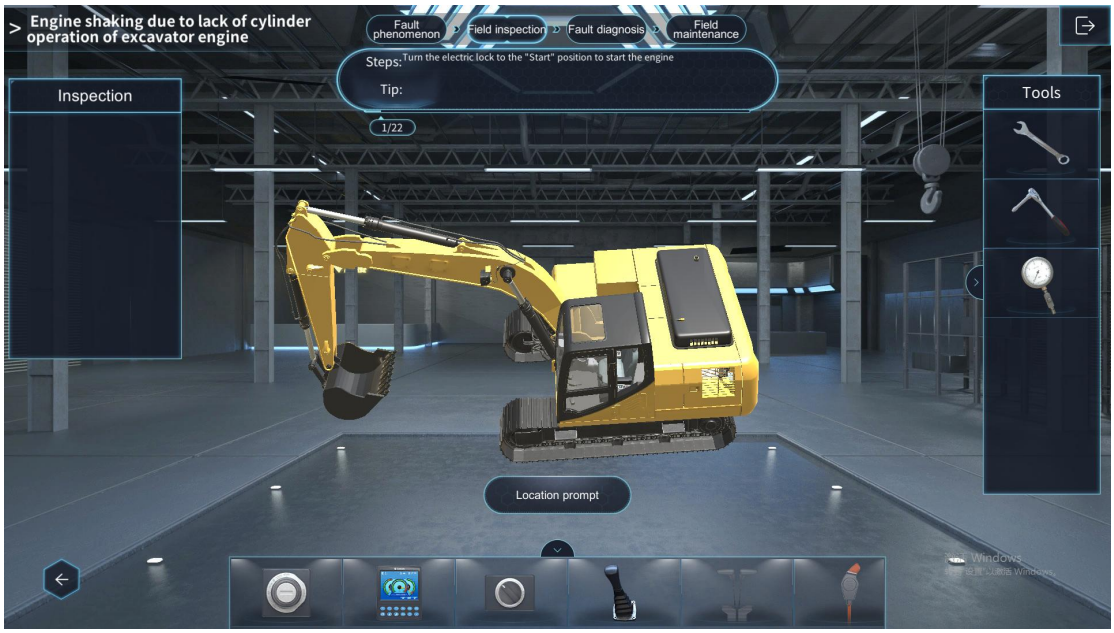
6.4.4. Inadequate Engine Oil Pressure due to Wear in Excavator Engine Oil Pump





6.4.5. Engine Shaking due to Lack of Cylinder Operation of Excavator Engine





7. Feature Highlights

- The software is a teaching tool developed for the chassis system of construction machinery. It allows seamless switching between disassembly training,assembly training, and different modes such as guidance mode, training mode,and assessment mode. It also records the training Work steps and duration, enabling students to significantly enhance their practical hands-on skills.
- In the Structural Principles module, users can freely drag, rotate, and zoom in/out on the models. The clear and intuitive analysis of structure and principles supports Works such as pausing, replaying,and exploding the models.
- The product can be used with the world-leading KMAX Desktop VR All-in-One Machine or on a PC. It offers a better interactive experience and stronger display effects.

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