

1 Collision protection with enhanced safety.

## SAFETY AT THE PUSH OF A BUTTON

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### Complex Control Logic Increases Risk of Collision

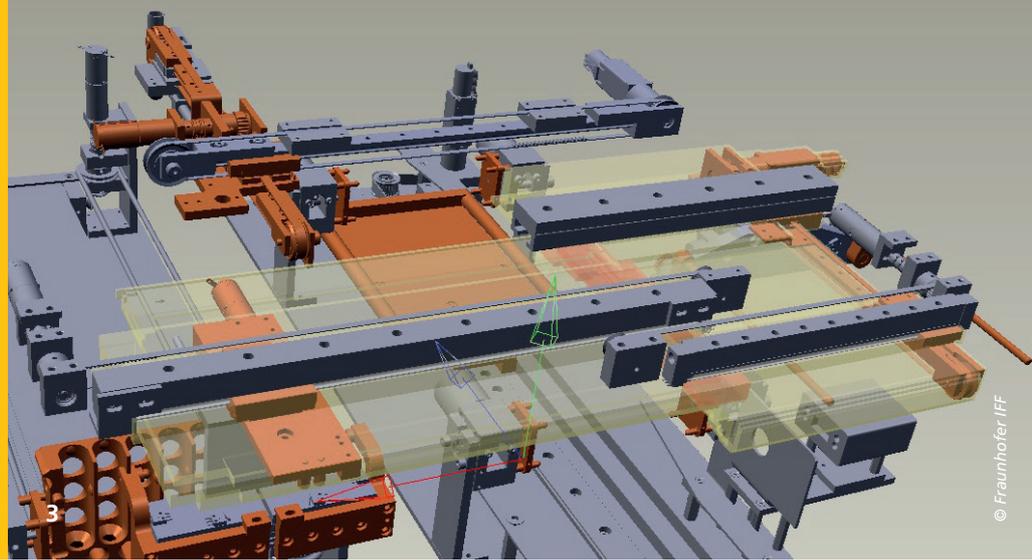
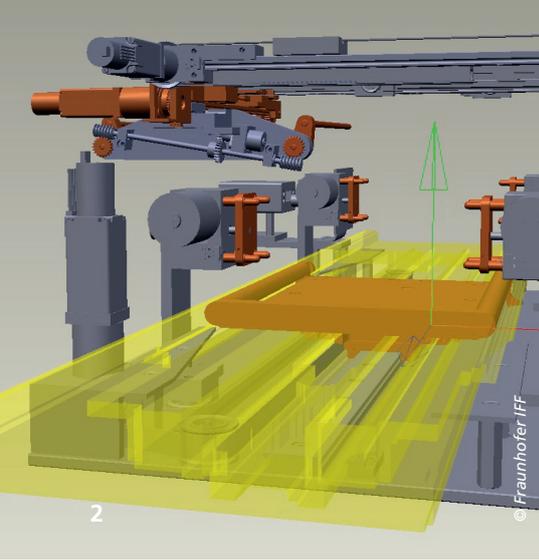
Advanced, highly optimized and efficient manufacturing equipment usually consists of a multitude of cooperating components controlled by different embedded systems and/or PLCs. Even when a machine malfunctions, its control logic has to prevent it from making uncontrolled movements or even taking hazardous actions. Situations in which internal collisions caused by operator errors, software errors or undetected errors in wiring can severely damage a machine are particularly critical. In the worst case, they could even endanger individuals.

In response, the Fraunhofer IFF developed the VINCENT software environment. The heart of VINCENT is a virtual machine that simulates and visualizes a real machine's functions. VINCENT is extended by the AGENS safety module, which facilitates the development of machine safety.

### Enhanced Safety Against Damage from Collisions

VINCENT's safety module makes it possible to eliminate safety hazards in advance. It uses the virtual model of a machine to automatically analyze all of its motion sequences and to detect critical operations. The software examines a machine's entire potential motion space and detects every potential point of impact. This is used to automatically create a safety program that protects a machine against internal collisions. Potential damage from collisions is practically eliminated. This saves control engineers considerable time and labor spent on programming and testing.

The enhanced safety in VINCENT eliminates impacts of programming errors and also validates machine operation. The machine really executes only non-colliding movements, regardless of the control program and operator actions.



### Effective Error Analysis on Virtual Models

The Fraunhofer IFF's software environment displays every potential collision domain of any of a machine's components. The virtual model already reveals which machine elements have to be protected against collisions by appropriate interlocks in the control logic. All critical machine scenarios can be detected on the virtual model. The real machine is commissioned with validated control code. Furthermore, sustainable operation of the machine is guaranteed since only the components replaced during retrofitting have to be added to the error analyses performed beforehand.

### Easily Understood Safety Rules

Although collision hazards are complex and sometimes hard to predict, the extended VINCENT safety module generates understandable and logical rules for every

designated safeguarded zone. The rules specify the actions required of the machine to evade safeguarded zones under every circumstance. Every rule can be visualized in the machine three-dimensionally.

### Efficient Generation of Safety at the Push of a Button

This feature is crucial for control engineers. Every defined rule-based correlation is automatically converted into program code and transferred to the control system. Understandable, well documented code is generated from the rules. The more complex the equipment is, the more effective the code generation and the resultant time savings are.

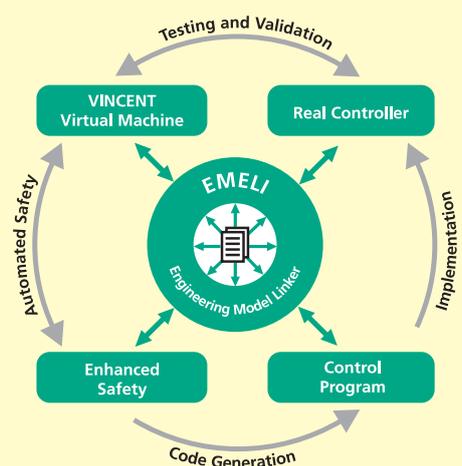
have developed to enable you to benefit from integrated and, thus, effective and efficient development of custom machines.

### Technology Partner to SMEs

Allow us to use our experience with digital engineering and the software system we

### Your Benefits from VINCENT

- Elimination of serious damage
- Efficient and automatic generation of safety parameters
- Up to 50 % less time and labor spent on programming
- Quality assurance from the beginning of the development phase
- Substantial reduction of complexity
- High and verified reliability of the generated code



2, 3 Safeguarded zones simply visualized.