Tessy was essential to get the 61508 certification on time.

Dr. Wolfgang Lüder, Becker Mining Systems, Friedrichsthal, Germany.

1   Becker Mining Systems

Becker Mining Systems was founded in 1964, and has its headquarters in Friedrichsthal, Germany.

With more than 1100 employees worldwide, total annual sales of Becker Mining Systems are well above about 160 million Euros.

Becker Mining Systems produce a range of automation, transport, communication and energy distribution systems for use within the mining industry.

Becker Mining Systems is certified according to EN ISO 9001:2000 and ATEX.

2   The Project

2.1   A Safety-Critical System To Test

The product for which the module / unit testing was done with Tessy, is an active explosion barrier system for gassy underground mines. This is a safety-system for use within a working mine, mainly consisting of a large reservoir of water. In case of a gas explosion underground, this system will detonate and produce a shield of water from the local reservoir. The water shall shield the men and material in the mine against the effects of the fire and the explosion.

Obviously, such a system can only be ignited once, like an airbag. Therefore, it is very important that it is not used prematurely by a "false alarm". On the other hand, the system must not fail, in case it is needed.

Because of the safety-related functionality, the system had to be certified according to IEC 61508, Safety Integrity Level 2.

2.2 Software Module Testing

Because of the safety integrity level, module testing of the software is mandatory. Becker Mining Systems selected Tessy as the tool for module testing.

The system under test is a multiprocessor system, consisting of three microcontrollers: two MSP430 devices from Texas Instruments and one M16C from Renesas.

The software for the three microcontrollers was written in C and comprised of about 270 functions. From these, about 80 were selected to be tested by Becker Mining Systems and also about 80 to be tested by Hitex as a test service for Becker Mining Systems. (The rest was tested included in the hardware tests).

2.3 Module Testing As Test Service
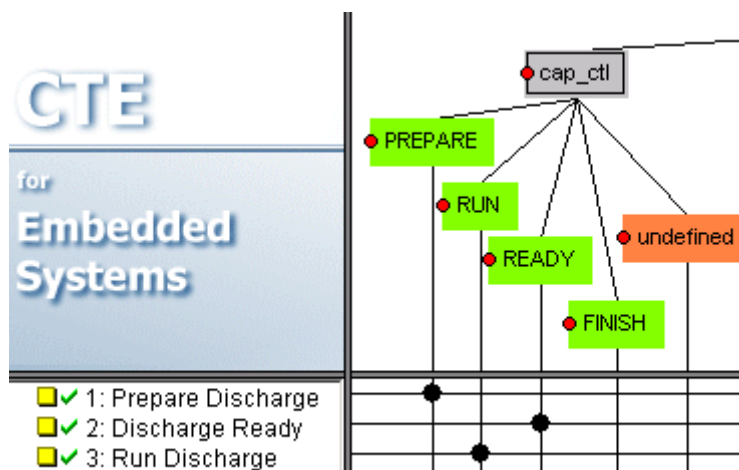
To determine the necessary test cases for each function, the Classification Tree Method was used. This allows an easy review of the testing ideas. Often, test data could be specified in the classification tree. For a function, typically 15 test cases were necessary, but some functions needed up to about 100 test cases. For each function the branch coverage (also known as decision coverage) was determined. When 100% coverage was not achieved, the reason for this was carefully investigated, and documented. For each function, comprehensive test documentation was created.

3 Conclusion

Tessy turned out to be essential in automation of the module tests. Without the help of Tessy, testing surely couldn't be finalized in time and probably some error would be gone undetected.

A short time after the tests with Tessy were finalized, the active explosion barrier system for gassy underground mines got its certification according to IEC 61508 from the Dekra Exam GmbH.

Becker Mining Systems would like to thank Hitex for meeting the tight schedule of this testing project, for which Tessy was prerequisite.