

InTouch at Grootegeluk Coal Mine

A powerful, InTouch application developed entirely by the mine, using Microsoft Excel, Microsoft Access, Visual Basic and more.

Wonderware InTouch has been used at the Grootegeluk Coal Mine near the Botswana border in the Northern Province. Grootegeluk is an open-cast mine 2,2 km x 1,8 km x 104 m deep which produces coal for steel production at Iscor and for Eskom's Matimba Power Station, at nearby Ellisras. Matimba is the third largest power station in South Africa with a generating capacity of 3990 MW. Wonderware InTouch is used at a number of plants on the mine and at the Matimba Power Station for different applications.



"Working in the Windows environment with such user friendly programs as InTouch, Excel, Access and Visual Basic make changes worthwhile and affordable."

General

Due to its remoteness, Grootegeluk has experienced considerable difficulty with some of the automation, control and reporting equipment on site and the overwhelming objective was to find a total solution that mine personnel were able to design, configure, implement, maintain and grow. Wonderware InTouch and other Microsoft products provided the perfect solution which fulfils all of the mine's needs and more.

Mining Operations

The coal is loaded with huge hydraulic shovels onto monster diesel/electric trucks utilising an overhead trolley powerline to transports coal from the pit bottom to the plant bunkers. There are three independent beneficiation plants at the mine which process approximately 30 million tons of raw coal to produce nearly 2 million tons of coking coal and 12 million tons of steam coal per annum.

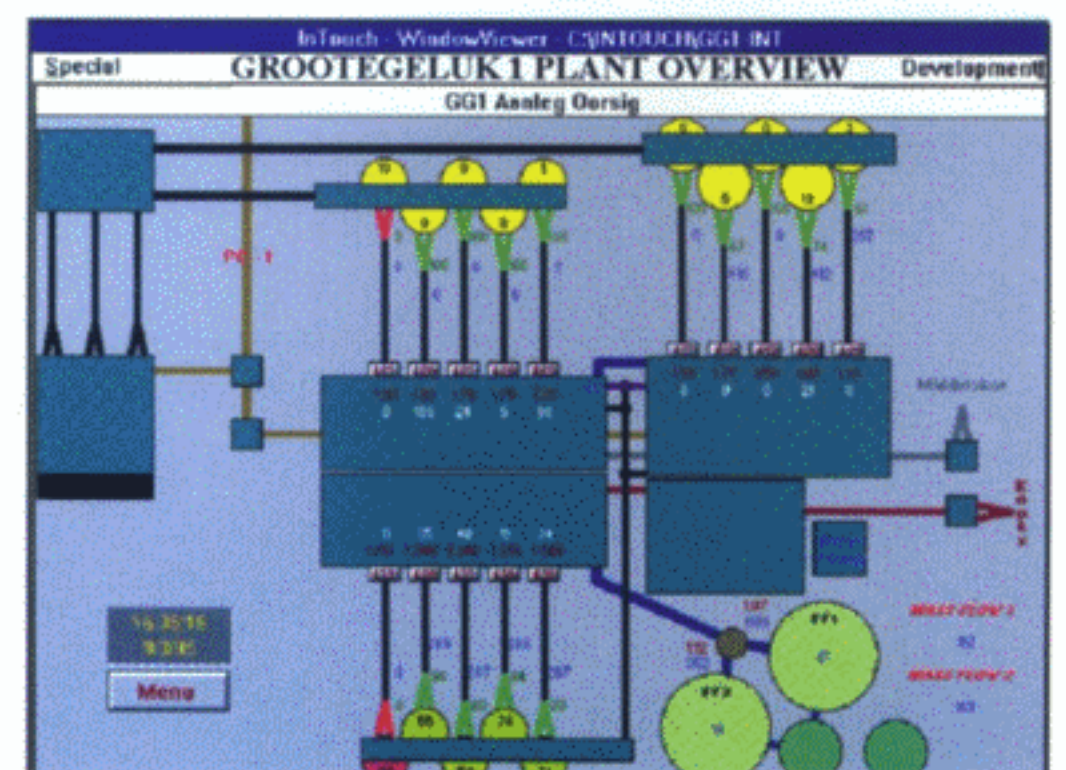


Fig 1: The Grootegeluk Coal Mine Plant Overview Screen on Wonderware InTouch Man Machine Interface in the Main Control Room.

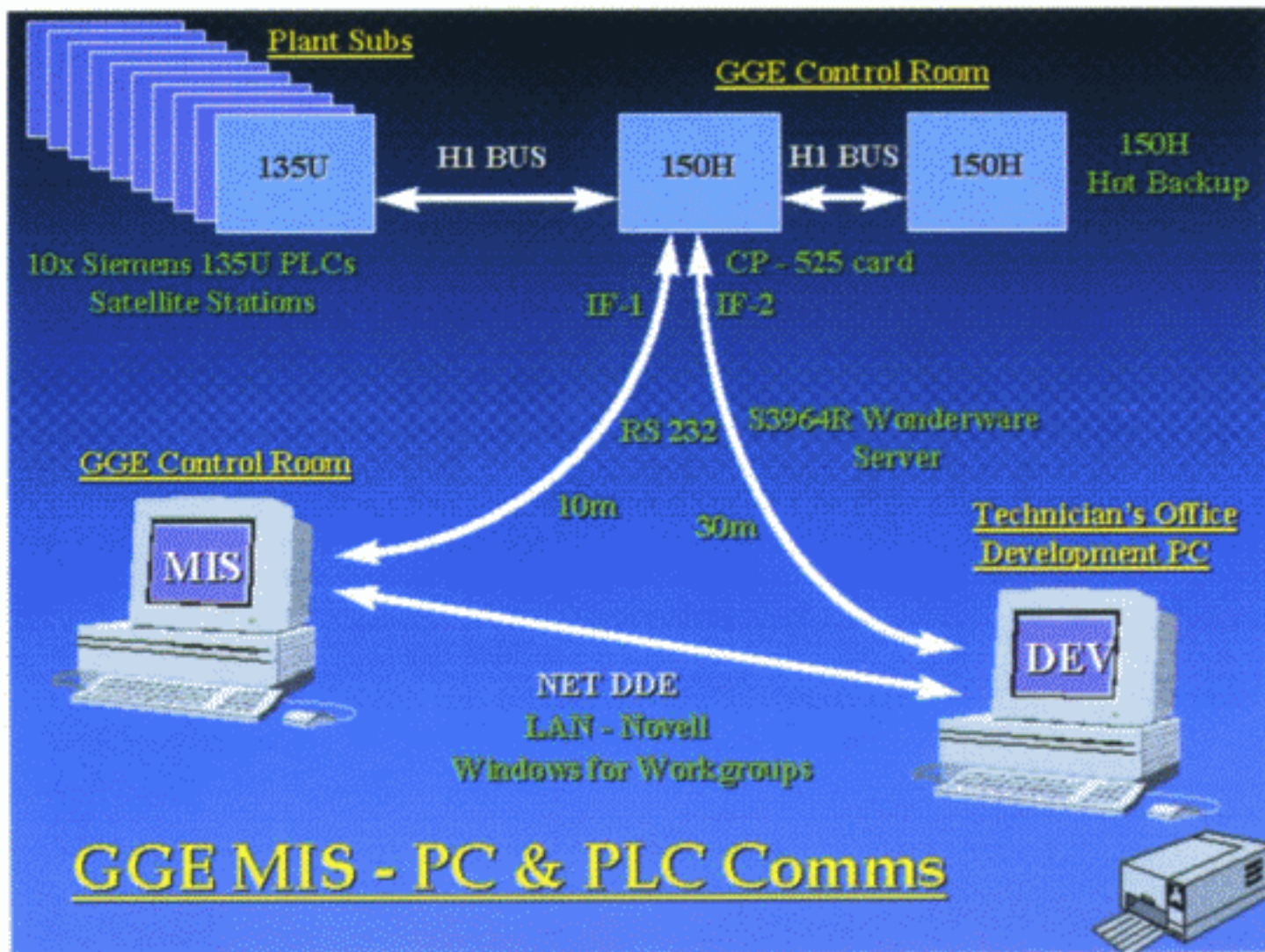


Fig 2: Illustration of the links between MMI in GGE Control Room, the development workstation and the Siemens PLCs in the Plant substation.

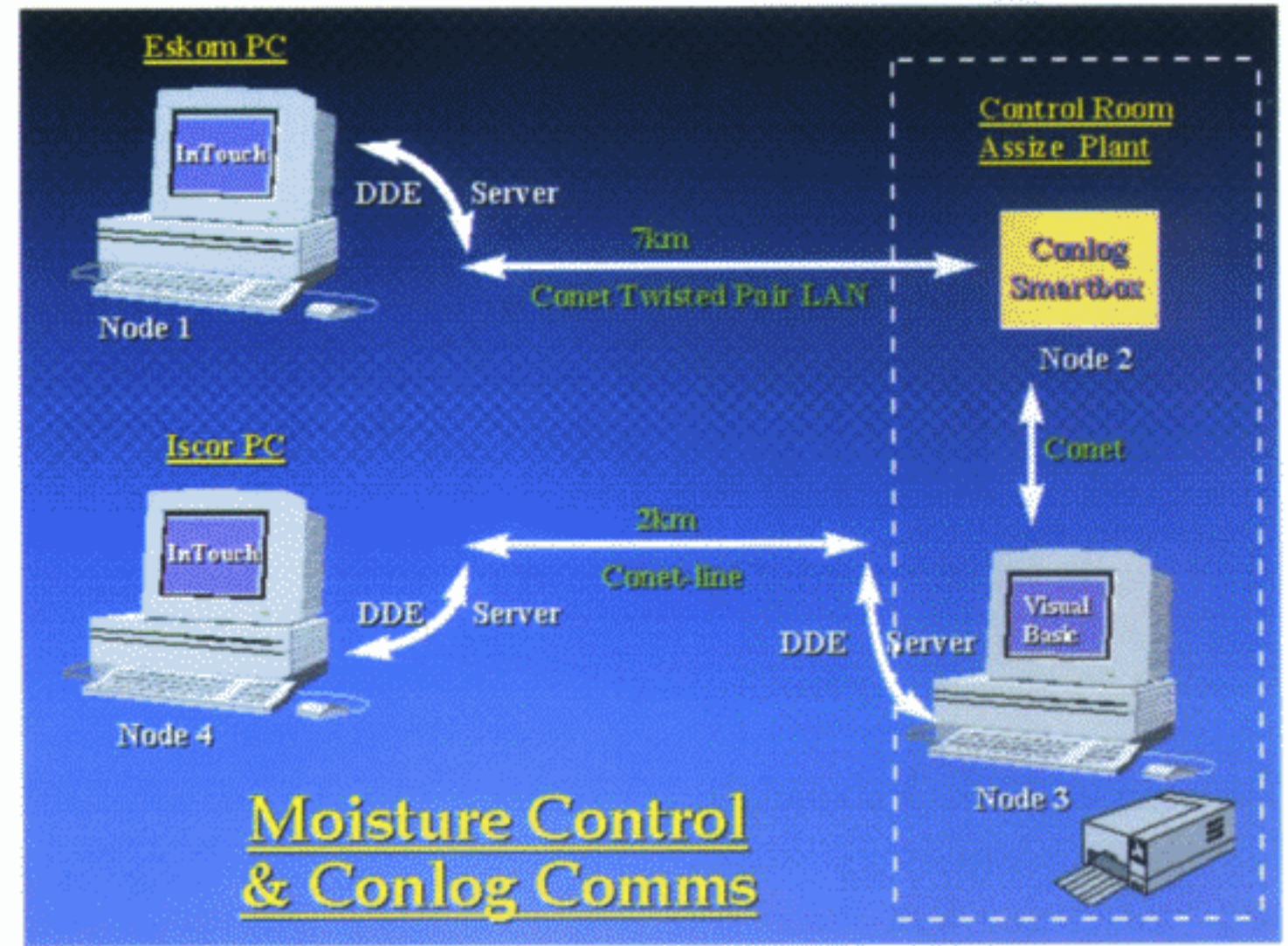


Fig 3: A Conet twisted pair cable is used to connect Iscor with the Matimba Power station for verification of coal tonnages conveyed. The network is routed through the assize Control Room between the two end destinations.

Beneficiation Plants

1. Grootegeluk 1 Plant produces coking coal for steel production and steam coal for Matimba.
2. Grootegeluk Eskom Plant (GGE) produces only steam coal for Matimba and is controlled by Siemens 135U and 150H PLCs with a Siemens Coros SCADA system.
3. The Pit Bottom (Dull Coal Plant) is a crushing and screening plant which produces steam coal from the lower banks of the pit with low waste handling. This is the largest coal washing facility in the world.

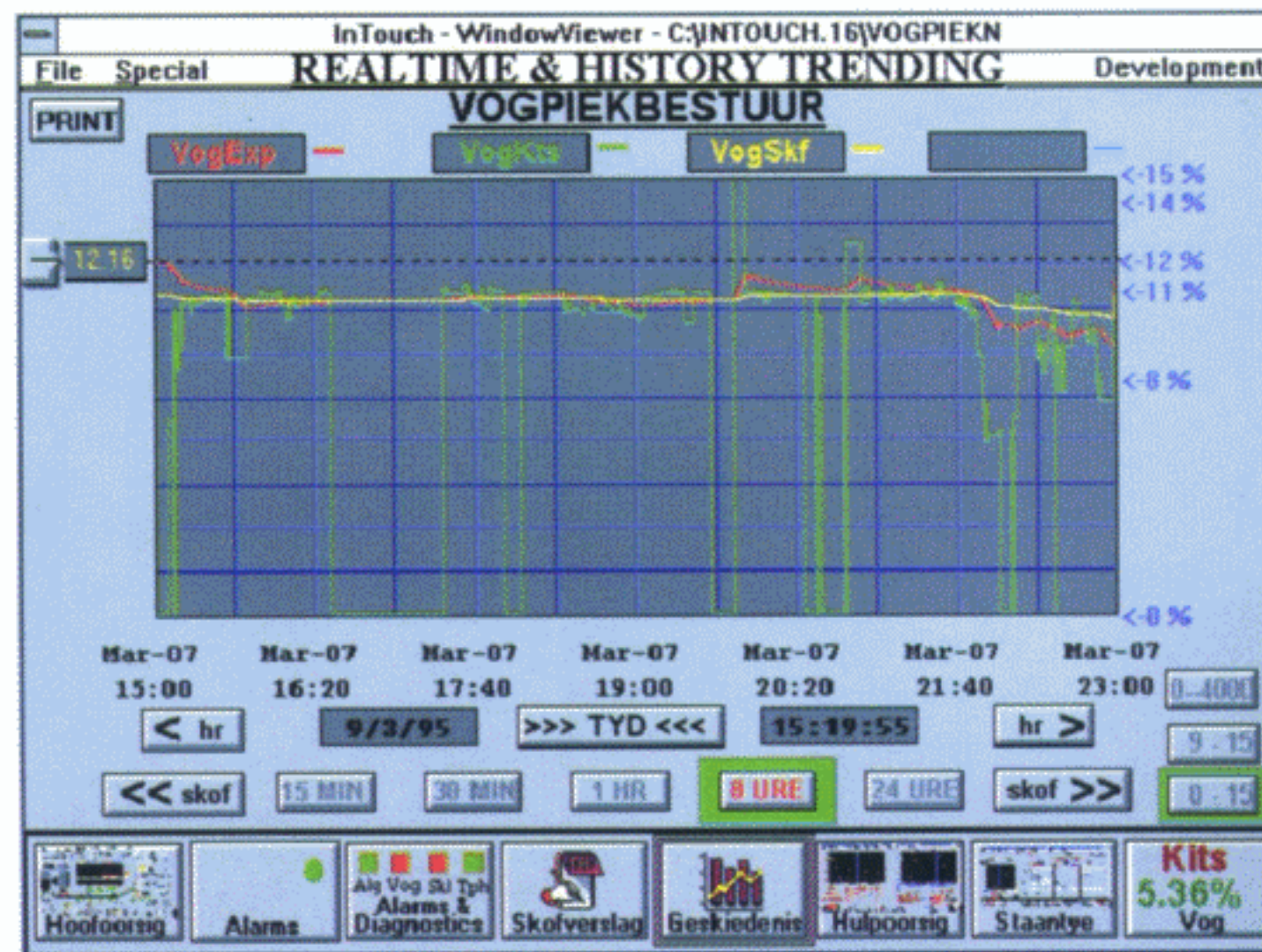


Fig 4: InTouch Real Time and Historical Trending of Moisture Variables critical to the contract between Grootegeluk and Matimba Power Station. The coal mine is penalised for excessive moisture content in the coal.

Matimba Blending Plant

The Matimba Blending Plant consists of 12 blending beds with a total buffer capacity of 450 000 tons, and is serviced by 3 Stacker/Reclaimers controlled by AEG-A500 PLCs. Because the beneficiation is a wet process, the water content of the coal must be reduced from about 18% to below 11% over a 1 week period, to meet contractual requirements with Eskom. Once dried, the steam coal is transported from the Blending Plant by a 7 km long conveyor belt to the Matimba Power Station.

There are a number of existing InTouch Installations at the Mine as detailed in the following sections.

Grootegeluk 1 Plant - Drum and Cyclone Modules

This was the first InTouch system on the mine and was originally installed due to high replacement cost of recorders/controllers for all loop controls which necessitated the installation of InTouch together with a Texas SIMATIC TI 545 PLC. Loop controls are done from InTouch.

Grootegeluk 1 Plant - Breaking, Screening & Silos Area

This is a remote relay-operated area with its own control room and InTouch station linked to a Texas TI 545 PLC for feeder speed control, silo levels and digital status monitoring.

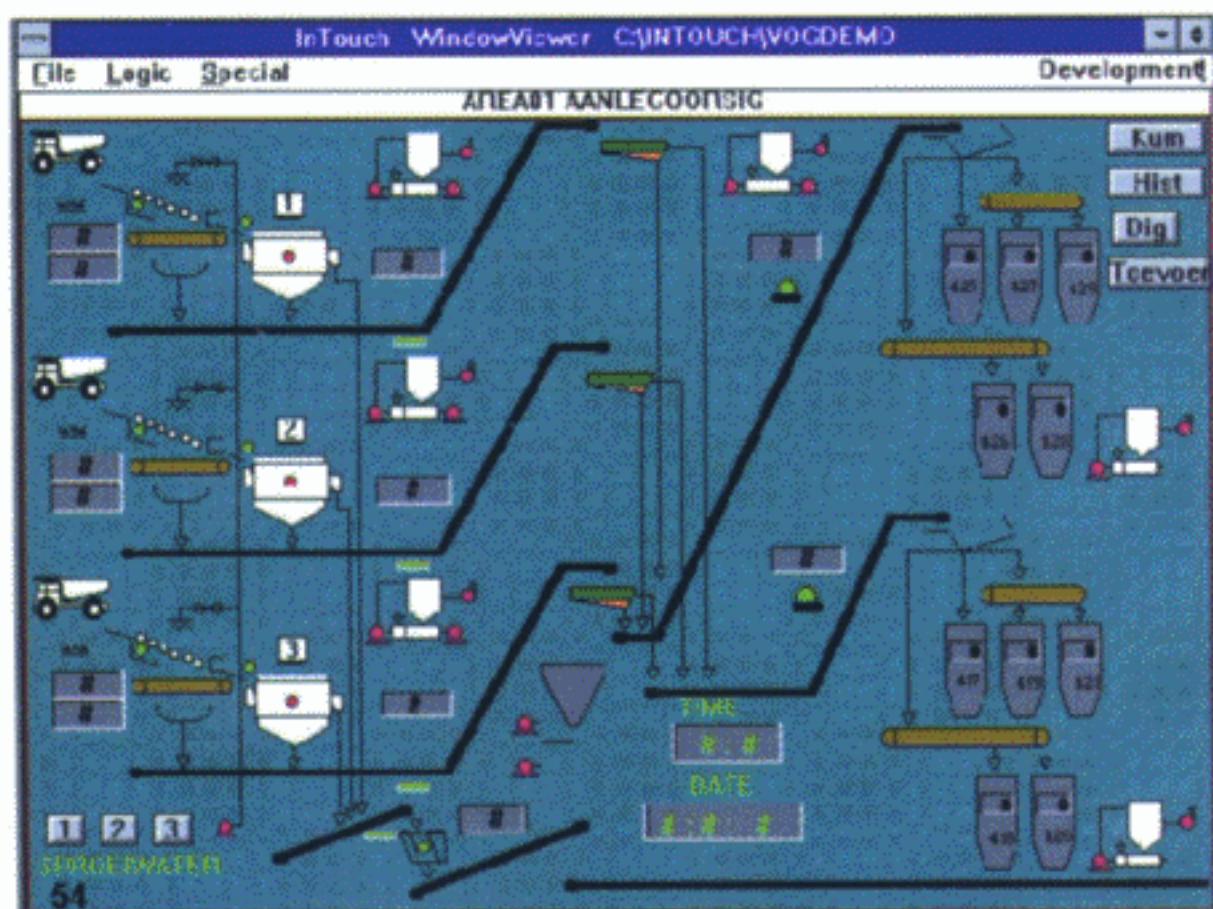


Fig 5: Coal Feed overview showing truck dumps, conveyors and blenders. Critical production parameters are also displayed.

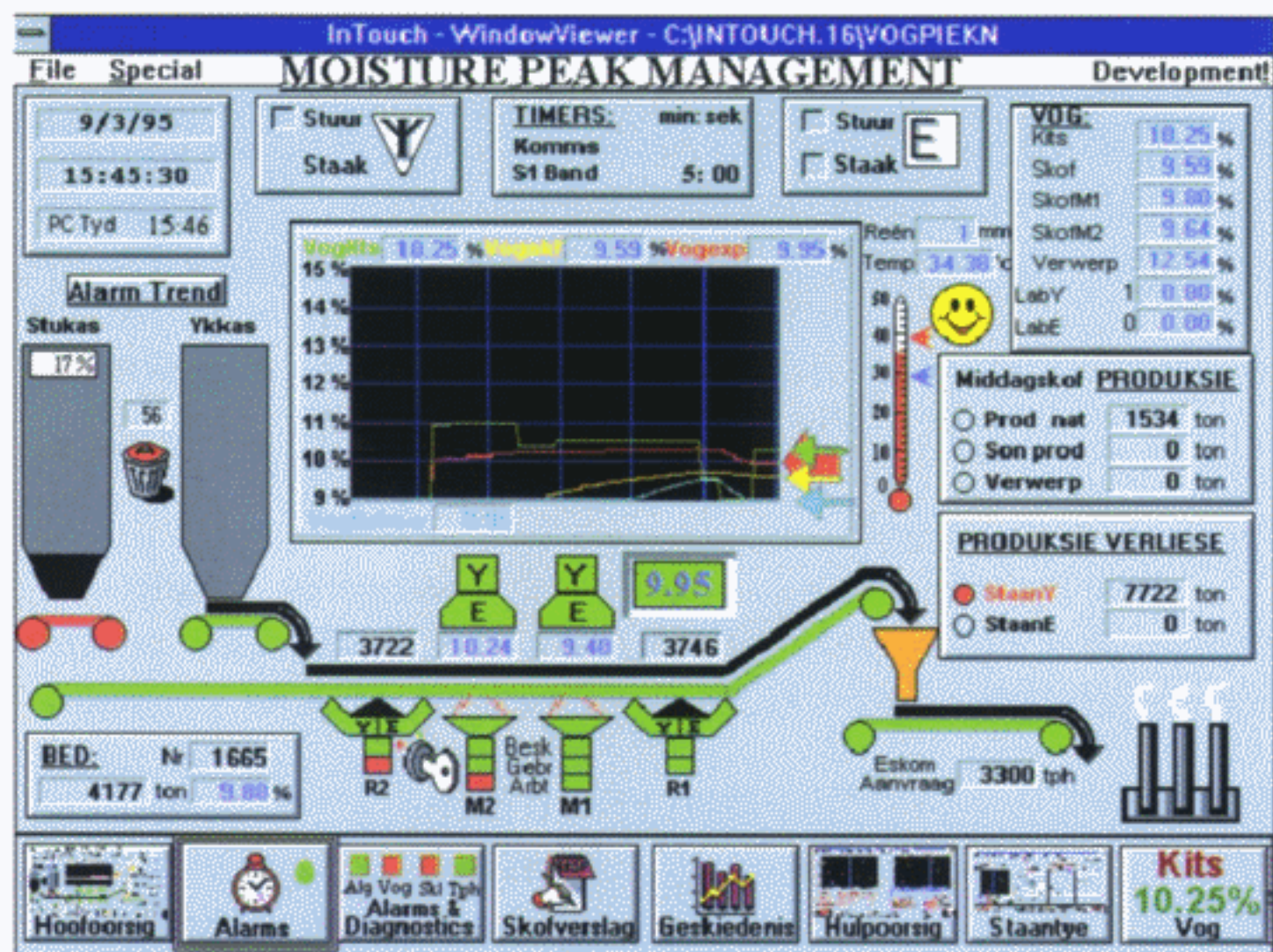


Fig 6: InTouch overview screen of on-line moisture measurements from microwave sensors on the coal conveyor. All critical parameters and alarms are shown. The system is designed for operators to switch to any of the main screens using buttons along the bottom of the display.

Grootegeluk Eskom Plant - Management Information and Defect Reporting System

The original Turbo Pascal MIS was changed to Microsoft Excel which reads all its information directly from the Siemens 150H PLC via a Wonderware S3964R DDE server. The system also uses InTouch to read variables from the plant, perform calculations and write the results back to the PLC for Excel to access. All the real time plant variable data is displayed in Excel spreadsheets with calculations determining hour, shift and day totals and at the end of the month all day totals are consolidated into the monthly report. All reports are printout at the end of the specific period for use by Management.

The defect reporting program makes use of InTouch to log all 'EQUIPMENT STOPPED' times which has a direct bearing on coal tonnages. At START-UP the stop and start times

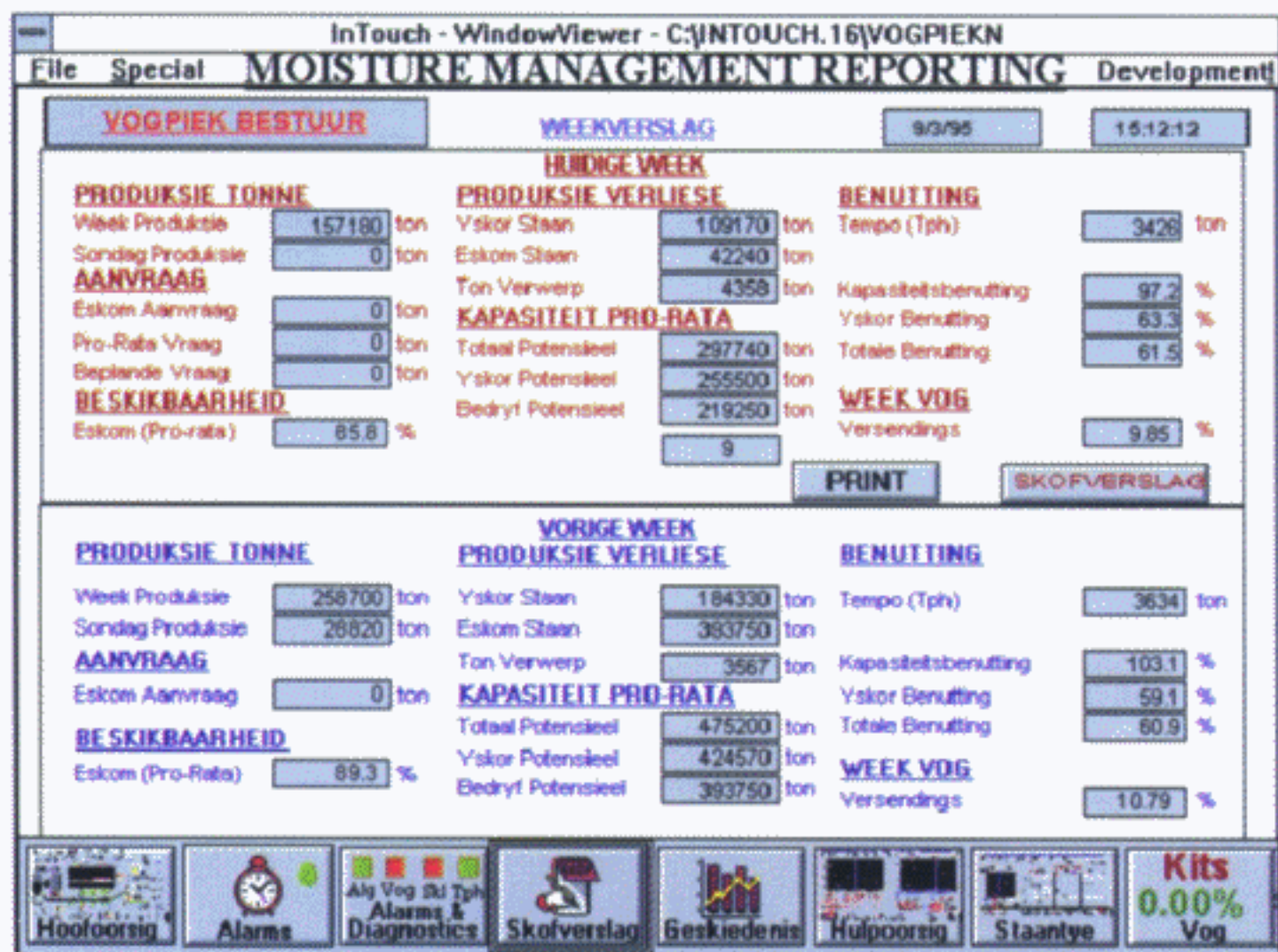


Fig 8: Summary reporting within InTouch for operators. Details include tonnages, efficiencies, availability and capacities for the current and previous week. Printouts can be obtained from a single button click.

together with equipment IDs are stored directly into a Microsoft Access data base using ODBC SQL connectivity. The cause and responsibility of each stoppage must be logged in Access before it can be cleared from InTouch. Different causes can be assigned to the same defect but only within the original time boundaries. Queries can now be run in Access with a set of criteria set up by the foreman to determine problem areas for maintenance.

Moisture Peak Control

To meet the contractual requirements regarding the water content of the coal the mine needs know the online moisture percentage. Off-line laboratory results were only available 8

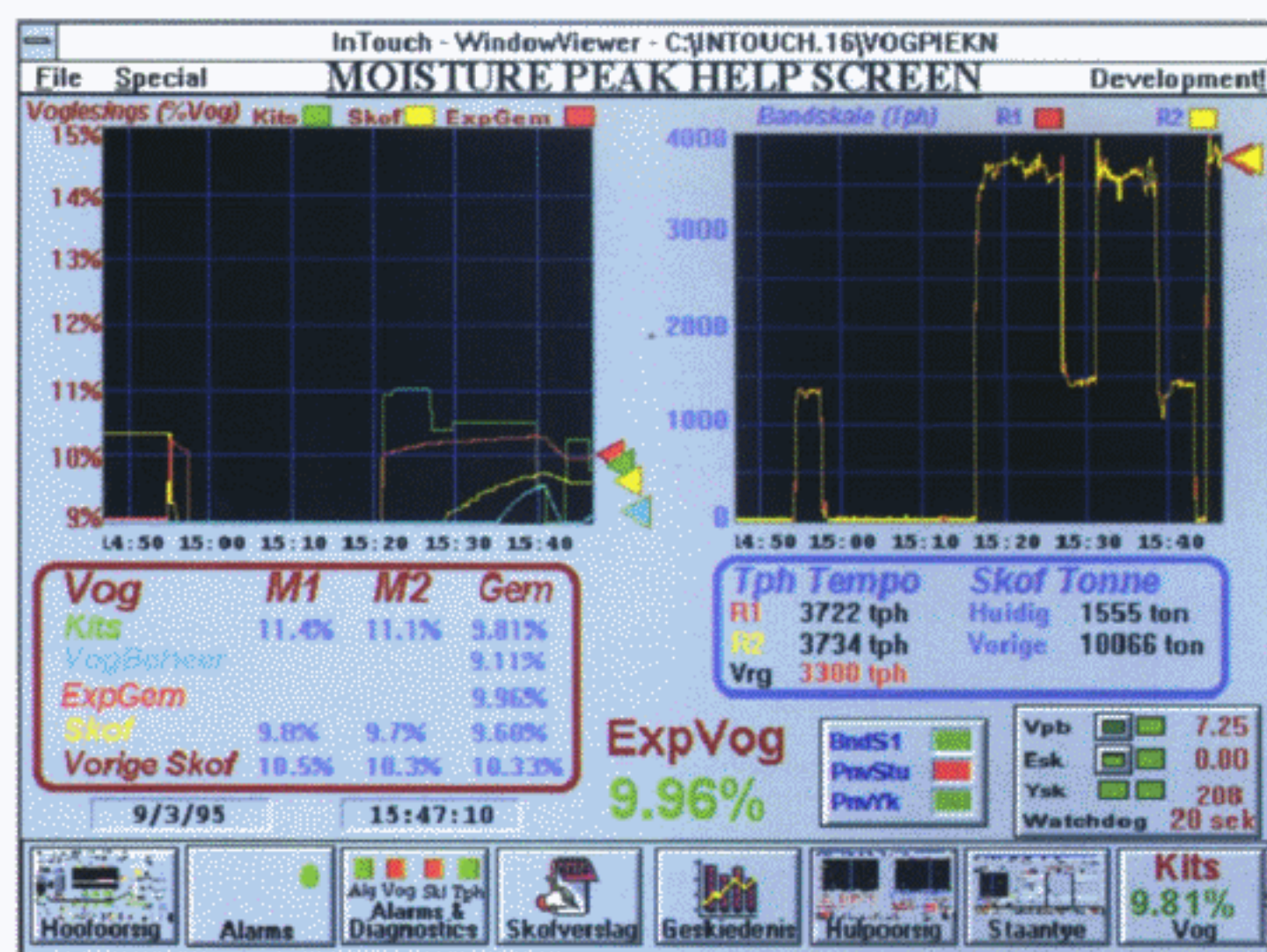


Fig 7: Detailed InTouch screen for analysis of moisture readings every 10 minutes. Other information such as tonnages shipped also displayed

hours after sampling and in that time, at 3500 tons/hour, 28000 tons of wet coal could be delivered to the Matimba Power Station with resulting heavy penalties.

To perform online moisture monitoring, two MCI Coalscan 4500 microwave online analysers (to test each other) have been installed. The specifications for these online analysers were guaranteed by the supplier for operation on a steel-core conveyor belt and they were paid back fully in 6 days, based on penalty charges for delivering coal with excessive moisture content to Matimba. Four Coalscan Ash online analyzers are also used on the mine.

Wonderware InTouch is used for monitoring and control at both Iscor and Eskom. Furthermore a PC programmed in Visual Basic is used for control instead of a PLC.

Communication between Iscor and Matimba is effected using a Conet twisted pair cable over a total distance of 9km. Wonderware developed a DDE Server specifically for the Conet network.

Grootegeluk - a BIG Success Story

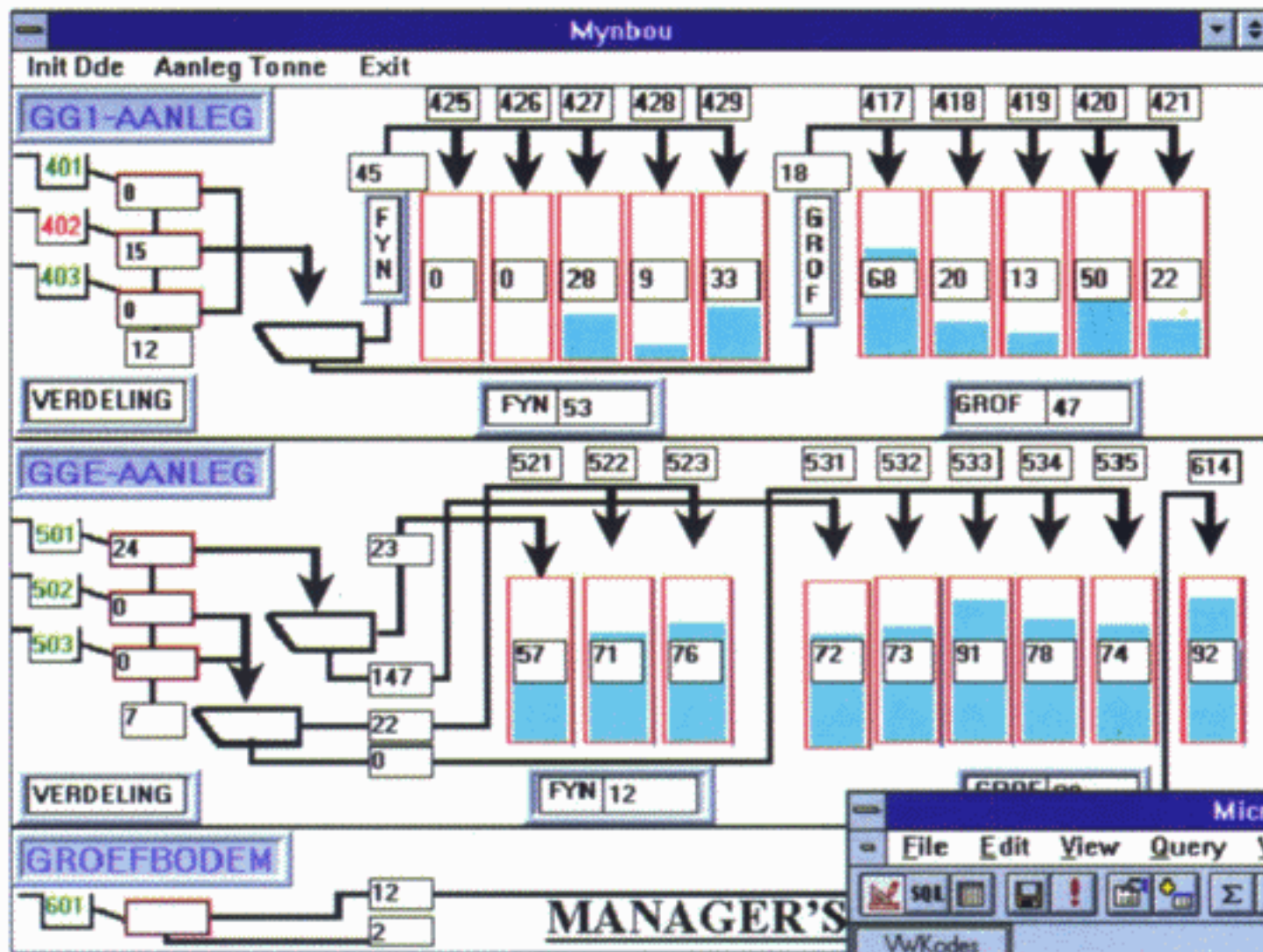


Fig 9: The Manager's Overview presents all necessary production information from the three mining areas on a single screen for an instant overview.

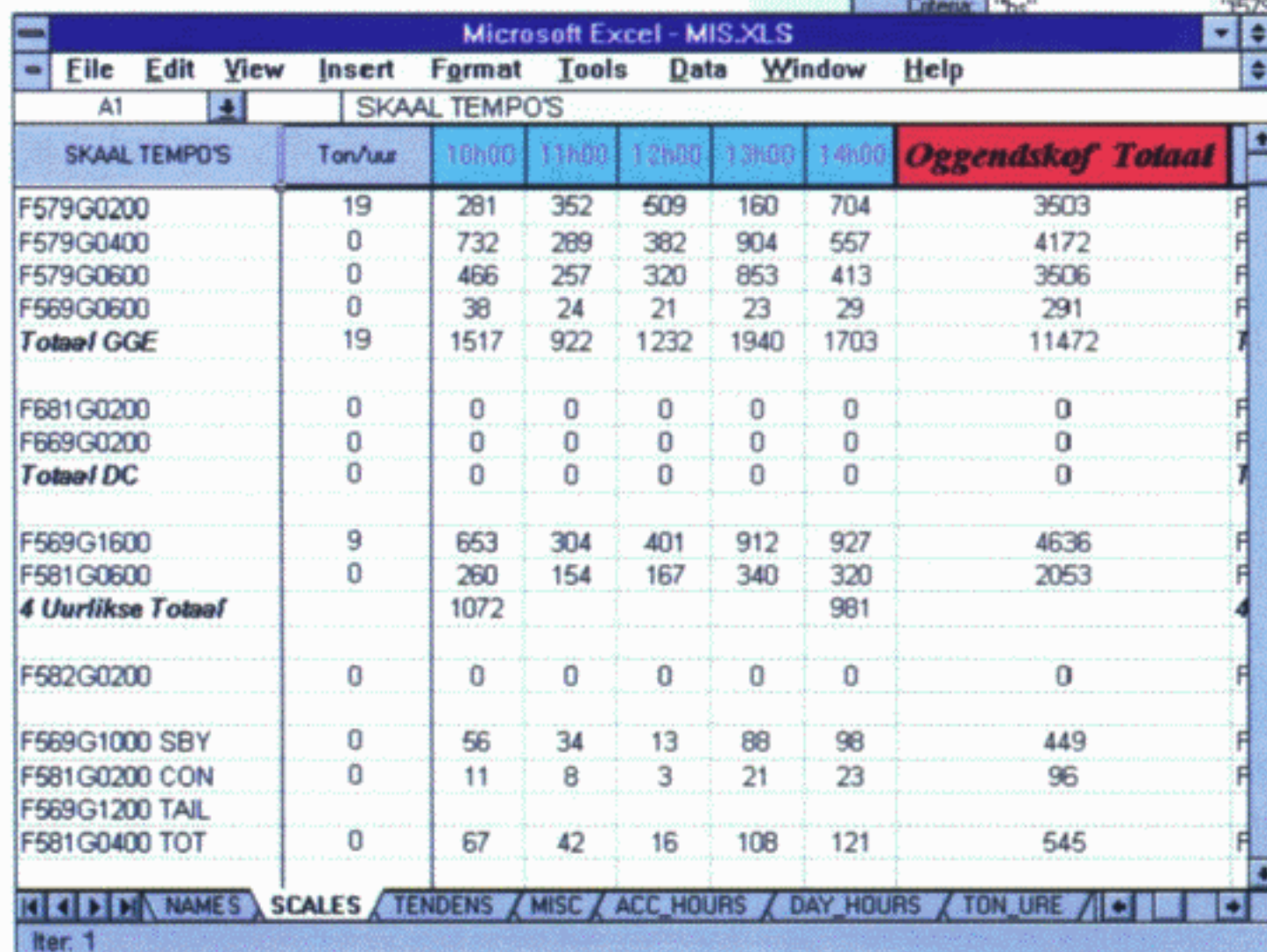


Fig 11: Microsoft Excel is used as a management tool for many different production parameters, facilitating quick and easy data analysis and calculations.

Managers' Information

The Mine Manager has access to real time plant data in his own office through Microsoft ODBC links and InTouch SQL which writes relevant data in Microsoft Access across the network. Mine personnel have programmed applications in Visual Basic, Microsoft Access, and Microsoft Excel themselves while all InTouch development was also done in house.

Other Developments

System development at the Grootegeluk plant will continue on an ongoing basis, including START/STOP control and hourmeter monitoring for 460 drives; MIS to determine lifetimes, mean times between failures, maintenance intervals and inputs for budgets and full control of more areas from the main control room.

At the Grootegeluk Eskom plant the P339 Defect Reporting Program has been replaced using Excel, Access and InTouch; Automatic logging of all Start/Stop actions to determine total running time of plant-equipment for use during maintenance planning; logging of responsible foreman with defect causes for every piece of equipment on the plant to determine availability and utilization of the plant; and the replacement of the existing process control interface.

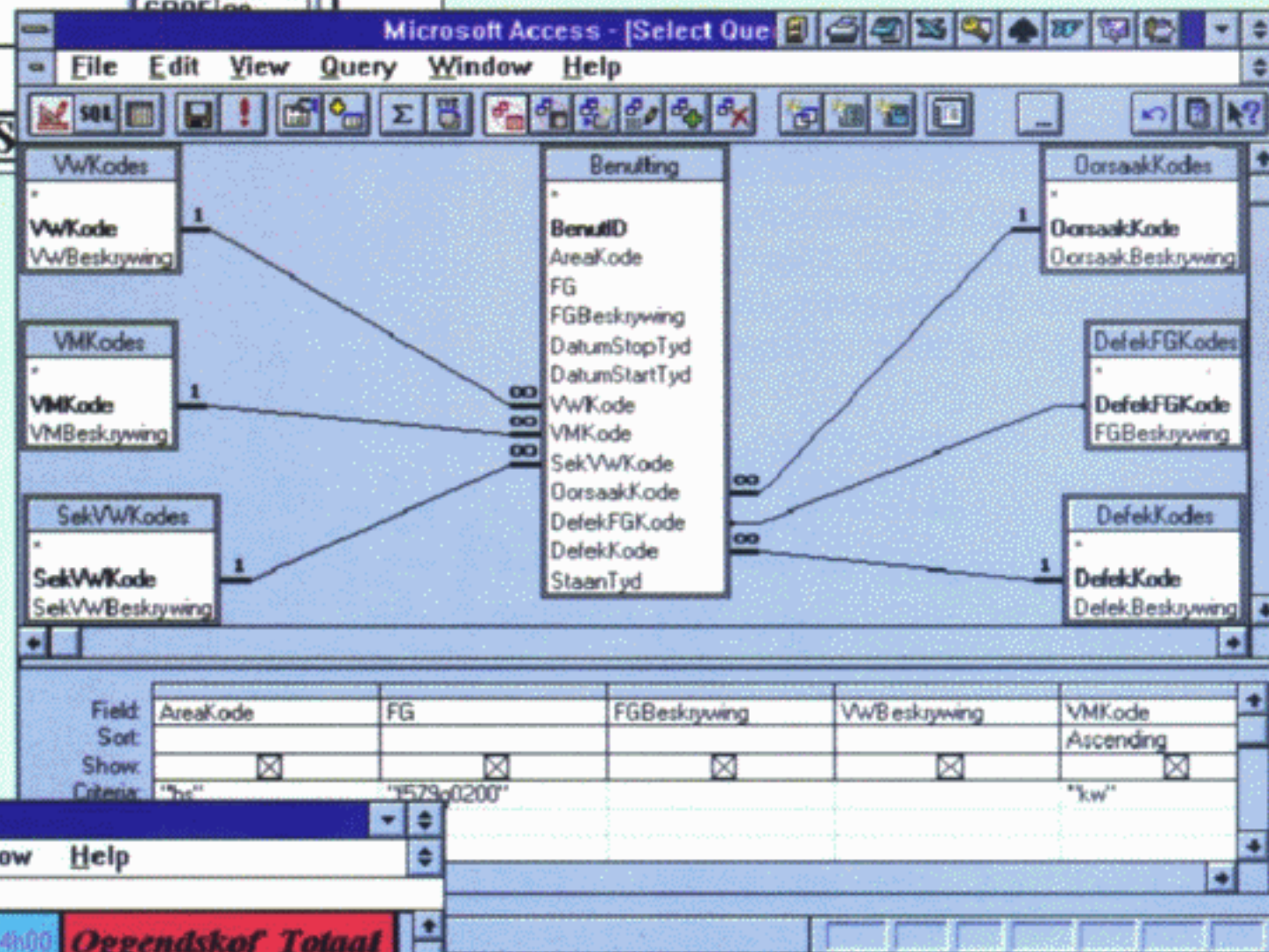


Fig 10: Microsoft Access Query Design Screen showing the various related tables which have been used to produce management information.

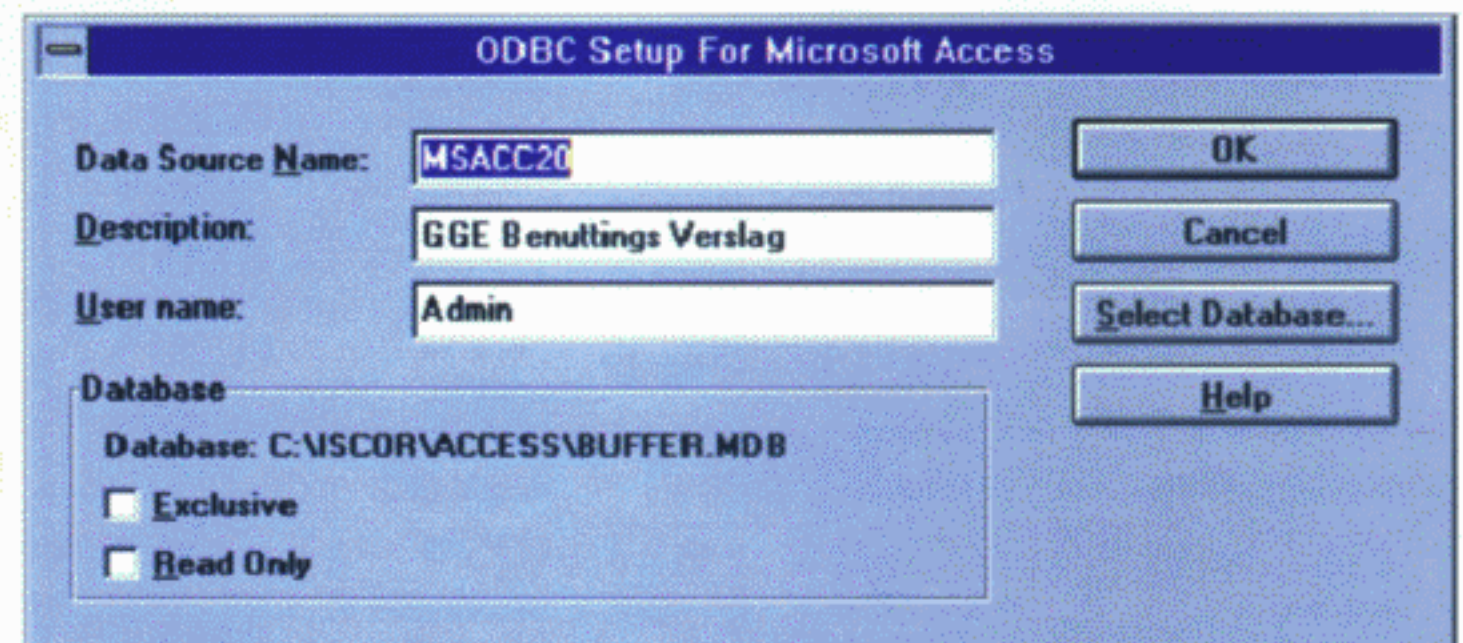


Fig 12: Microsoft Access client uses ODBC (Open DataBase Connectivity) interface to InTouch Data for management reporting.

The Wonderware Factory Suite of Industrial Automation Software is marketed and supported in Southern Africa by sole distributors, Futuristix. Application engineering is primarily conducted by a network of accredited system integrators.

Futuristix
PO BOX 75591
GARDENVIEW
2047

Tel: (011) 622 8181
Fax: (011) 622 2888
email: wonder@iafrica.com