



ROHR Clamshell Bucket Diagnostics System

Summary

ROHR's patented bucket service and diagnostics system monitors the vital bucket function

- Position of the bucket
- Tilt angle of the bucket
- Closing pressure
- Opening pressure
- Oil level in oil reservoir
- Oil temperature
- Condition of oil filter

In order to assure a smooth start, a soft start is available (optional) to control the opening and closing speed of the grab shells. The bucket's drive motor can also be powered via frequency controlled drive (optional).

Description

The power source of the bucket is supplied by a specially designed amphibious power cable which is guided by a series of sheaves to allow for the bucket's lifting and lowering actions.

Transmission of data between the bucket and the IPC is accomplished by a double cable bus network line (PROFIBUS DP) which is also incorporated in the amphibious power cable. Network communication, via PROFIBUS DP, is an acknowledged worldwide standard that assures quick data transfer and provides a rapid update rate with short reaction times.

The data transferred by the data bus is evaluated in a programmable control system then transferred to an industrial PC (IPC) where the data is prepared and visually displayed on the screen.

The bucket values are displayed on the screen where they can be adjusted and continuously monitored. If the admitted values are exceeded, the drive will react immediately to offset the malfunction. This safeguard prevents severe damage to the bucket, hoist, and other vital dredge components. Each error message is recorded and can be printed with the date and time of malfunction.

Components:

Position of bucket shells

The position of the bucket shells is monitored by an angle transmitter (absolute value transmitter). Limits for OPEN and CLOSE can be adjusted via the IPC.. The position of the bucket shells is displayed on the screen of the IPC. Due to the constant monitoring of the shell position, the shells are automatically stopped at their limit positions. In addition, this system allows the operator to detect foreign objects (Scrap metal, logs, etc.) that can be trapped between the bucket shells. This helps prevent foreign objects from puncturing dredge pontoons or entering the processing equipment.

Oil level (Oil reservoir: Bucket head)

The oil level for the hydraulic system is constantly monitored by an oil level indicator and is displayed on the screen of the IPC. Limit values for **Warning**, **MIN** and **MAX** can be altered directly on the screen of the IPC. Loss of oil or penetration of water into the oil reservoir is constantly monitored and visualized on the screen of the IPC.

Oil temperature

The temperature of the oil is measured by means of a PT 100 sensor and is shown on the screen of the IPC. Temperature limit values can also be adjusted via the IPC.

Opening and closing pressure on the hydraulic cylinders

The opening and closing pressures of the hydraulic cylinders are acquired by a pressure transmitter and displayed on the screen of the IPC. The pressure limit values of the cylinders can be set via the IPC with no adjustments to the bucket itself.

Tilting angle of the bucket

The tilting angle of the bucket (single axle set diagonally to the rope suspension) is controlled by a tilting angle transmitter and is displayed on the screen. These limit values can be adjusted via the IPC. If the admitted tilting angle is exceeded, the lowering of the bucket is stopped, thus preventing the bucket from rolling over. In turn, damage to the cross beam, hoist ropes, and power cable, as a result of the bucket rolling over, is limited.

Condition of the oil filter

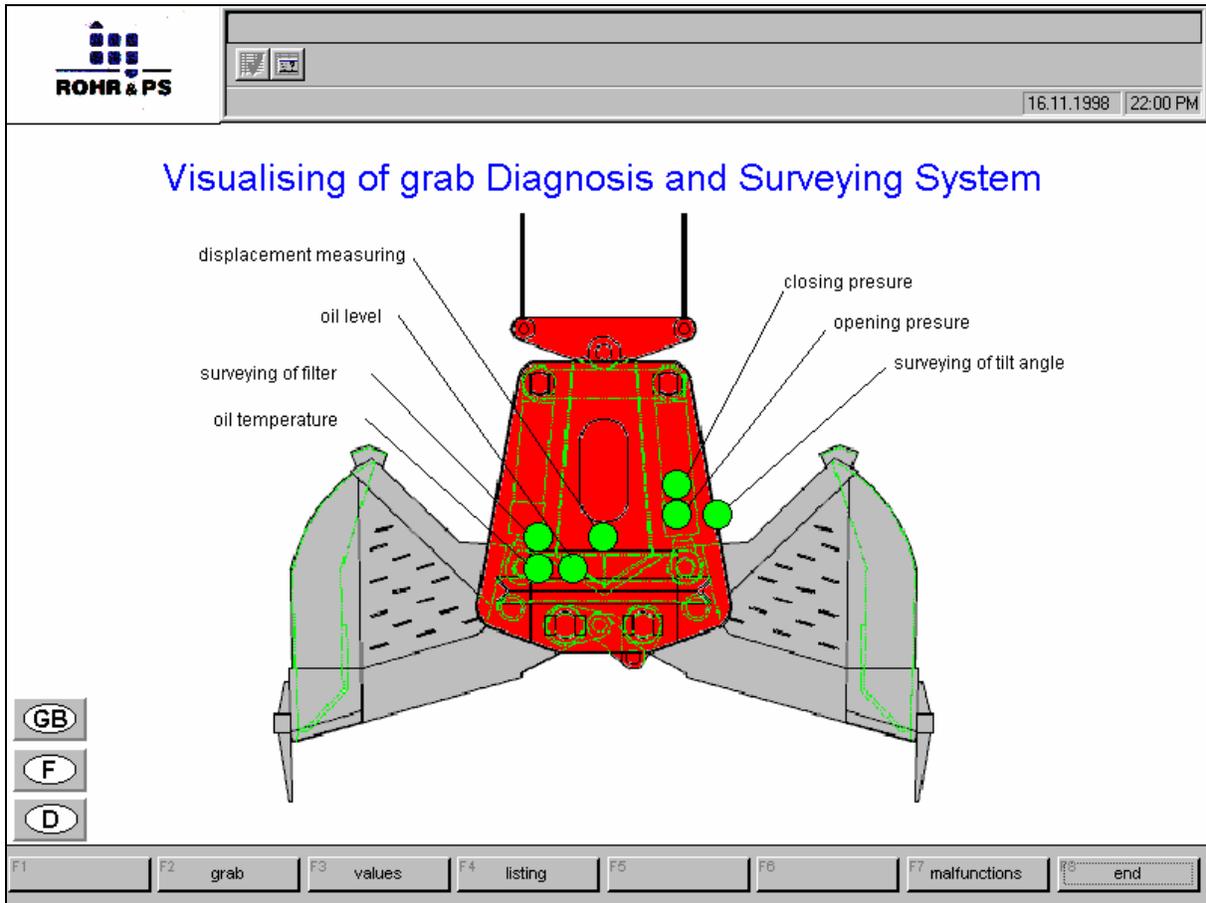
The degree of foreign particles in the oil filter is monitored and displayed by means of an oil pressure control and two switching contacts. Therefore the oil filter must only be changed when there is a high degree of sediment detected in the filter.

Summary of Advantages

- Exact knowledge of service conditions at any time
- Real-time detection of malfunctions
- Instantaneous reaction to exceeded limit values (prevention of severe damage)
- Prevention of cost intensive and unexpected downtimes as a result of continuous oversight of vital bucket functions.
- Prevents foreign objects (Scrap metal, logs, etc.) from puncturing dredge pontoons and damaging bucket shells.
- Protection of the drive mechanisms by speed control via frequency converter *
- Adaptation of motor speed and cycle times, via variable speed drives, resulting in improved excavating capacity (depending on material conditions) *
- Prevention of rolling bucket by means of tilting angle transmitter
- Energy saving by omission of peak loads when starting motor *
- Defined stopping of the motor according to limit positions by displacement transmitter (protection of drive mechanisms)

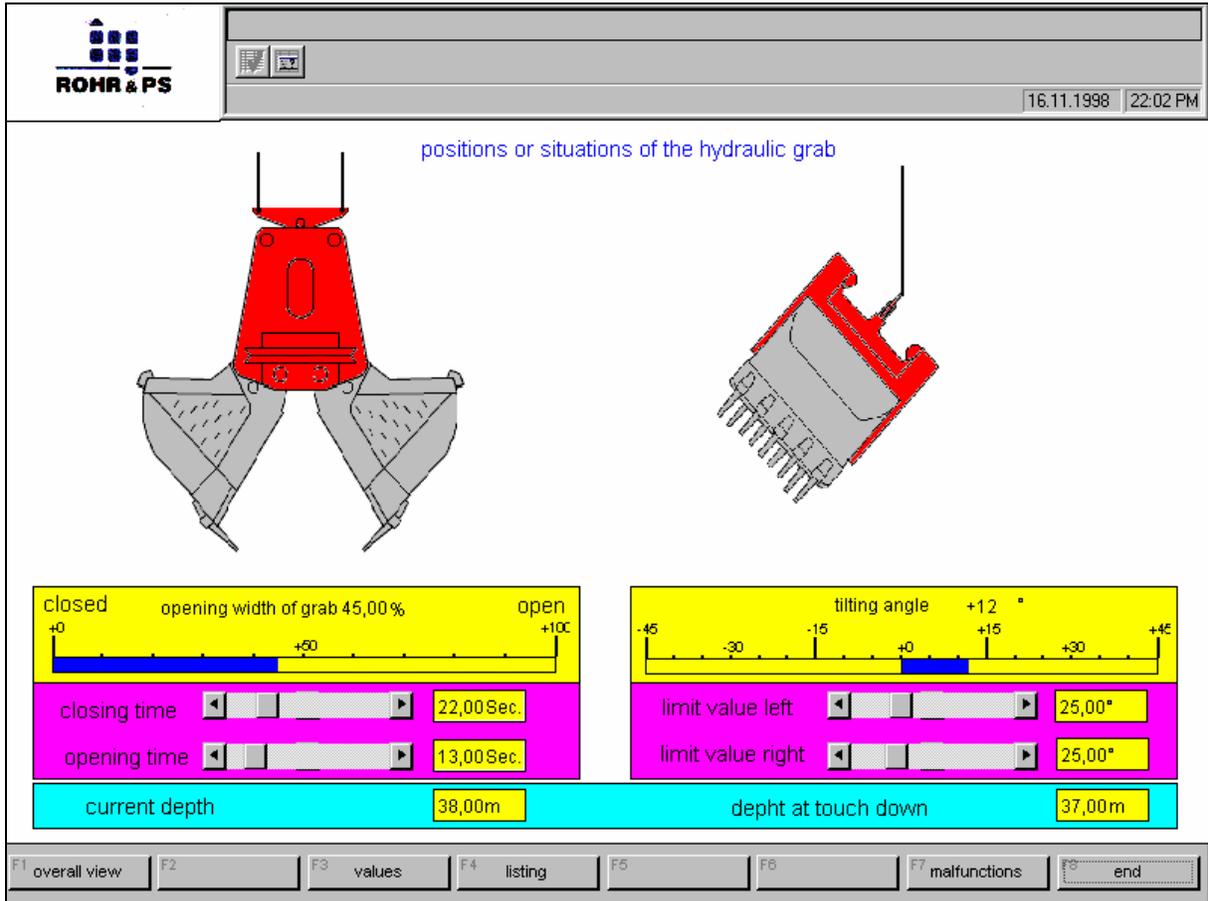
* Variable Frequency Drive optional

Bucket Diagnostics System Screen Shots:



Main screen for surveying the complete system on the IPC.

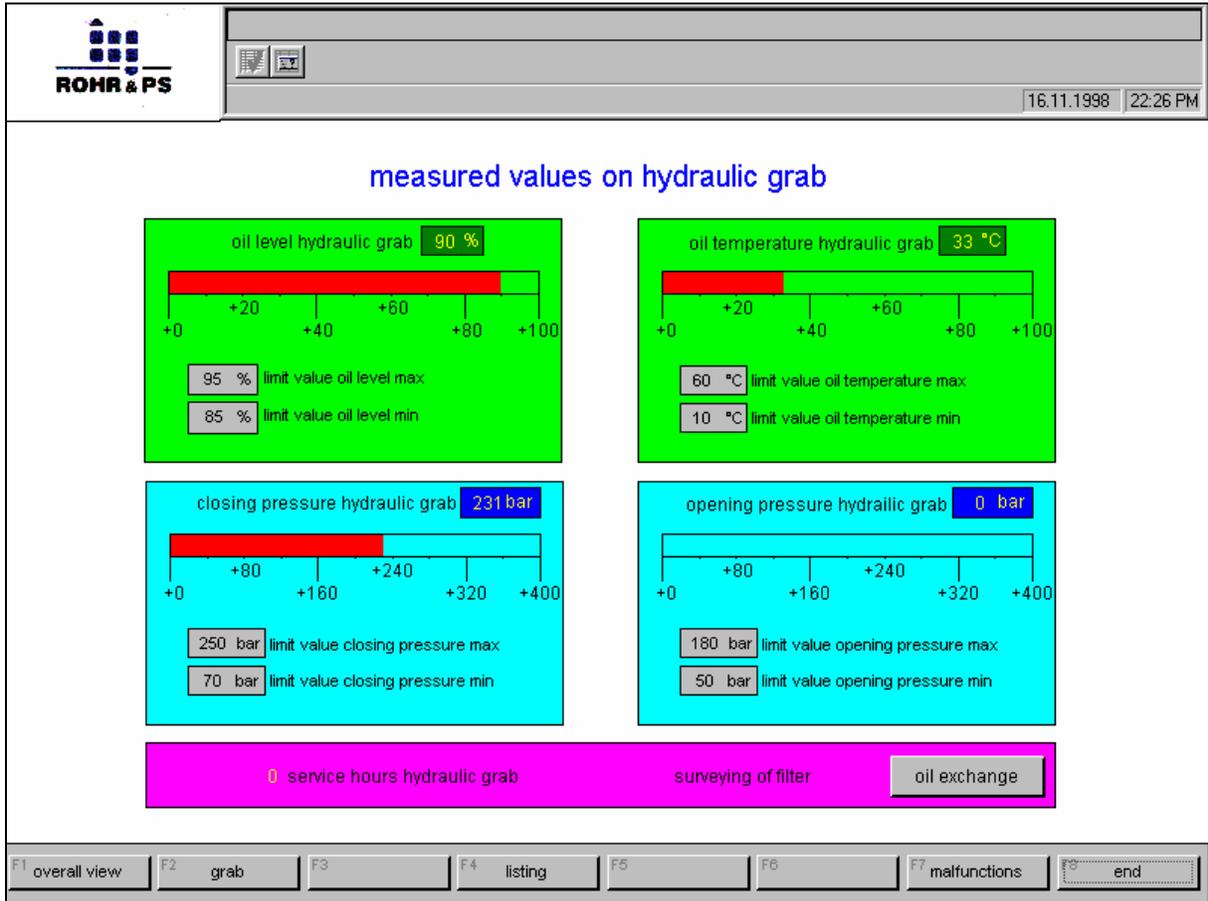
Tabs with detailed information on specific bucket functions can be opened by control keys or mouse.



This screen shows the current position of the bucket shells, as well as the tilting angle of the bucket, once it has reached the digging face.

The depth of the current bucket cycle, as well as the depth of the previous bucket cycle, is also displayed on this screen.

Limit values for the tilting angle of the bucket and opening/closing times are adjusted in this view.



The view shows an overall view of the current values for:

- Oil level
- Oil temperature
- Closing pressure
- Opening pressure

The limit values for the above functions are adjusted in this view.

Meldearchiv

16.11.1998 22:03 PM List: 0 Ack: 0

| date | clock | No. | malfunctions | |
|----------|----------|-----|------------------------------------|---|
| 03/11/98 | 18:28:25 | 33 | oil temperature grab too high | C |
| 03/11/98 | 18:28:25 | 34 | oil level in grab min | C |
| 03/11/98 | 18:28:30 | 33 | oil temperature grab too high | A |
| 03/11/98 | 18:28:32 | 34 | oil level in grab min | A |
| 03/11/98 | 18:28:49 | 33 | oil temperature grab too high | G |
| 03/11/98 | 18:28:49 | 34 | oil level in grab min | G |
| 03/11/98 | 18:38:18 | 33 | oil temperature grab too high | C |
| 03/11/98 | 18:38:18 | 34 | oil level in grab min | C |
| 03/11/98 | 18:38:18 | 35 | temperature of grab motor too high | C |
| 03/11/98 | 18:38:18 | 36 | oil filter of grab plugged | C |
| 03/11/98 | 18:38:24 | 36 | oil filter of grab plugged | A |
| 03/11/98 | 18:38:25 | 33 | oil temperature grab too high | A |
| 03/11/98 | 18:38:27 | 34 | oil level in grab min | A |
| 03/11/98 | 18:38:28 | 35 | temperature of grab motor too high | A |
| 03/11/98 | 18:38:35 | 33 | oil temperature grab too high | G |
| 03/11/98 | 18:38:35 | 34 | oil level in grab min | G |
| 03/11/98 | 18:38:35 | 35 | temperature of grab motor too high | G |
| 03/11/98 | 18:38:35 | 36 | oil filter of grab plugged | G |
| 03/11/98 | 18:38:38 | 33 | oil temperature grab too high | C |
| 03/11/98 | 18:38:38 | 34 | oil level in grab min | C |
| 03/11/98 | 18:38:38 | 35 | temperature of grab motor too high | C |
| 03/11/98 | 18:38:38 | 36 | oil filter of grab plugged | C |
| 03/11/98 | 18:38:42 | 36 | oil filter of grab plugged | A |
| 03/11/98 | 18:38:43 | 33 | oil temperature grab too high | A |

0

F1 overall view F2 grab F3 values F4 listing F5 F6 F7 end

The above view shows an example of an information protocol of bucket malfunctions. The malfunctions are highlighted in different colours according to their status (alert, reset and operational). All malfunctions are additionally saved in an archive where reoccurring malfunctions can be addressed.

As an option, the long-time archive can be saved on disc for further evaluation (Example: Excel file).

shift protocol

dredge operator **John Miller**

Start of shift **08:00** clock

Closing of shift **18:30** clock

| | |
|------------------------------|------------------|
| Cycles per shift | 220 |
| no of cycles total | 15231 |
| Excavated quantity per shift | 1489,5 t |
| quantities excavated total | 11365,8 t |
| minimum grab capacity | 1,2 t |
| maximum grab capacity | 10,3 t |
| average grab capacity | 7,5 t |
| minimum dredging depth | 26,6 m |
| maximum dredging depth | 30 m |
| average dredging depth | 28,6 m |
| service hours hoist in shift | 4,52 h |
| total service hours hoist | 128,9 h |
| service hours grab in shift | 1,84 h |
| total service hours grab | 128,9 h |
| energy consumption in shift | 584 kWh |
| total energy consumption | 40899 kWh |
| energy consumption per lift | 2,6 kWh |
| energy consumption per ton | 0,2 kWh |

The optional shift protocol shows an overall view of the main data of an elapsed shift.

This creates a very compact proof of the individual events of a shift which can easily be filed.