

The humble **sub form** is the **linchpin of oil analysis** (Part One)

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In countless articles, seminars, training courses and technical bulletins it has been stressed that there are two main reasons for an oil analysis programme to fail.

The first is that the oil sample is not representative of the oil in the system, in other words, the dreaded 'bad sample'.

The second involves information regarding the sample. This can either be wrong or, quite simply, missing. In the majority of cases it is the second reason that causes the most problems, not just in terms of the diagnosis but for data processing and the laboratory.

This technical bulletin will look at that odd piece of paper that accompanies each and every sample bottle and is known as the submission form (see example on page 3). In some cases this may be in an electronic format but its structure and purpose are essentially the same. The submission form, or sub form for short, asks a number of questions about the oil sample. These questions will be looked at in detail along with how to answer them, what information is required and most importantly what can go wrong if that information is missing or incorrect. This is of vital importance as 20% of all samples are submitted with missing or incorrect details.

THE SAMPLE NUMBER

The first thing that appears on the sub form is the sample number, this is a unique seven digit number followed by two check digits, for example, 1234567 89. Some sample numbers may start with a letter and the initial character may represent certain information that is important to Wearcheck in terms of record keeping and identification - ABB joint venture samples have sample numbers that start with a 4 or a 5. It is

important to ensure that the number of the submission form and the bottle are the same, if the sub form and bottle numbers do not match up then the number on the bottle will be used.

When a sample arrives at Wearcheck, the bottle goes to the laboratory and the sub form goes to the data processing (DP) department. Data from the sub form is captured in DP; if the information on the bottle is different from that on the sub form then the information on the bottle will not be captured. Details are only taken from the bottle if the sub form is blank or has not been returned with the sample. Information written on the black, outer mailing container will also not be captured.

20% of all samples are submitted with missing or incorrect details

It is important for the sub form to accompany the bottle. If the two are separated, DP will not submit data without the bottle and the laboratory will have insufficient information on the bottle to process the sample. If samples are submitted electronically, it is important that the submission data is received by Wearcheck before the sample bottles arrive in the laboratory. Without that data, the sample will have to be queried, creating extra work in the DP department and causing a delay in the analysis and diagnosis of the sample. The bottle top should be marked 'PC' to indicate electronic submission and that there will be no accompanying paperwork.

The next field asks for a customer name or telephone number, this is simply a

way of easily identifying who the sample has come from and is more for the customer's use than for record keeping at Wearcheck.

YOUR CUSTOMER CODE

The next field is for the customer's Wearcheck computer code. This is a six character alphanumeric code that links all customer information on the Wearcheck database to the sample. The first character is usually a number and identifies the area of the country where the customer's head office is located, for example, 7 indicates KwaZulu-Natal and the Cape. If the first character is a letter then this identifies certain groups or types of samples: M denotes an industrial (non-mobile) customer. The next three letters are usually made up of the initials of the company name and the last two letters show a city, town or area where the company is located. In the example 7JPHWD, 7 stands for KwaZulu-Natal, JPH represents John's Plant Hire and WD shows the company is based in Westmead.

A sample register keeps a record of all samples sold and who purchased them

On the Wearcheck database the customer code contains all the customer's details and reporting structure. It identifies names, addresses, telephone and fax numbers, email addresses, who gets what types of report and how that information is communicated. Statistical information about the nature of the business is also recorded. This facilitates the automation

of the whole reporting system.

Sample numbers are linked to a customer account number that is, in turn, linked to the customer code. It is important to put the customer code on the submission form, particularly if one customer account number has more than one customer code associated with it. A sample register keeps a record of all samples sold and who purchased them. This operates as a simple security measure.

Sample bottles are generally pre-paid, that is, the service is paid for up front so that means the bottle has commercial value. If bottles were to be stolen then the reports would still go to the recipient logged on the Wearcheck data base and not to another name written on the sub form.

COMPONENT IDENTIFICATION

The piece of information that is required next is the fleet or plant number - some way of identifying where the sample has come from. Sample information is stored on the Wearcheck database in a four-level hierarchy. At the top is the customer code that has just been discussed. The next level is the machine, then the components and finally the actual samples. So, a customer has different machines or vehicles, the vehicles have components and samples can be taken from those components.

There is also room on the sub form to enter a registration or serial number. The Wearcheck data base allows

EXAMPLE OF A SUBMISSION FORM

LABORATORY COPY



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☎ (031) 700-5460
FAX: (031) 700-5471

JOHANNESBURG
☎ (011) 392-6322
FAX: (011) 392-6340

MOBILE EQUIPMENT OIL SAMPLE SUBMISSION FORM

SAMPLE NUMBER	1234567-89
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Customer Name / Phone No.	JOHN EVANS
Your WEARCHECK Computer code	7JPHWD
Fleet or plant no.	1409-1
Registration or serial number	50H01234
Site	WESTMEAD

SAMPLE DETAILS

Component type (e.g. Engine)	ENGINE
Date of sample	7 th SEPT 2004
Service meter reading	7654 Hours
	Kms
Period oil in use	247
Has this oil been drained? (Mark the appropriate box)	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Have the oil filters been changed (if applicable)?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Oil consumption	<input type="checkbox"/> Ltrs <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Excessive

Comments or special circumstances:
RISING SUMP LEVEL

Job Number	JPO01
Service meter reading when component	7407
	Overhauled Kms / Hrs Replaced Kms / Hrs

SHADED AREAS - IF NEW OR CHANGED DETAILS

Chassis make & model (e.g. Mercedes Benz 2632, Caterpillar D9H)	CATERPILLAR 1409
Component make & model (e.g. A.D.E. 407T, Fuller RT 12509)	CATERPILLAR 3306
Oil brand, type & grade (e.g. Castrol Turbomax)	SHAL RIMULA SUPER 15W40
Oil capacity	28 Litres
Oil additive? (state brand)	NO
Radiator additive? (state brand)	SHAL TRIQUARD

NOTE:
IF ALL THE RELEVANT INFORMATION IS NOT SUPPLIED WITH THE SAMPLE AN ANALYSIS WILL BE CARRIED OUT BUT NO RELIABLE DIAGNOSIS CAN BE GIVEN

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customers to record an alternate ID for each piece of equipment; this can be useful as the owner of a machine may want to use a plant number whilst an OEM may want to refer to a machine serial number.

Full details are needed in order to give the best diagnosis possible

Wearcheck is not concerned with what naming systems are employed but it is vitally important that once a piece of equipment has been given an ID then that name is used consistently. If a different ID is used for the same piece of equipment then information will not go missing but will fail to link up properly. When a sample is first submitted from a component of a machine certain details are recorded in the database such as the make and model of the component and the oil used. For example, the customer is John's Plant Hire, the vehicle is BD1 and the component could be the left final drive. The information recorded might be a Caterpillar D6H, left final drive lubricated with a Shell Rimula D 50. This will be stored in the database using the four-level hierarchy already discussed:

Customer code: 7JPHWD
Machine: BD1
Component: left final drive
Sample: XXXXXXXX

If the sample is submitted against a plant number such as D6H-1 instead of BD1 then the information recorded against BD1 will not tie up with the new submission data and the report will come back requesting machine make and model details and what oil is in use. So, once

you have given something a name, do not change it.

The last thing that can be recorded in the top section of the sub form is the site. This is more for the convenience of customers and aids housekeeping. It allows vehicles to be placed in groups but has no impact on the analysis, submission or diagnosis of the sample. The middle section of the submission form, dealing with sample information, will be dealt with in Part Two of this technical bulletin.

MACHINE DESCRIPTION

The third section of the sub form which is shaded in pink only needs to be filled in when registering a component for the first time or when details change. These details are recorded against a particular component that will be linked to a particular machine that will be registered with a particular customer. This is the hierarchy that was mentioned earlier and will be stored on the Wearcheck database. The next time the component is sampled, the customer code, vehicle ID and component name will be sufficient to retrieve all this data. Obviously, if the vehicle ID or component name changes, the data will not be lost but will no longer link up to what has been entered on the submission form.

The first piece of information that is required is the vehicle make and model - Caterpillar dump truck is not good enough. Full details are needed in order to give the best diagnosis possible, even Caterpillar 777 is insufficient. A Cat 777 and a Cat 777D are two very different animals that are even powered by different engines.

Next the component make and model needs to be known. In the case of final drives, differentials, gear system, bearings and hydraulics, this information is not all that critical. A bell B40D truck basically has a Bell B40D hydraulic

Once you have given something a name, please do not change it

system and that is sufficient information to provide an accurate diagnosis. However, the makes and models of engines, transmissions and gearboxes are important. If the machine had just been described as a Bell ADT, then this could have been powered by a Deutz, ADE or Mercedes Benz engine. You don't want to be looking for an internal coolant leak on a Deutz engine. To a lesser extent it is also useful to know the make and model of gearboxes and transmissions as certain vehicles could have been fitted with more than one type. Although both a gearbox and a transmission use gears to transmit power, Wearcheck uses a convention whereby a transmission is taken to mean an automatic transmission and a gearbox means a manual gearbox. It will be appreciated if customers can also adopt this convention as it does not affect the diagnosis but it does determine what tests the laboratory will do on the sample.

BRAND AND GRADE OF OIL

The brand and grade of oil needs to be stated for a number of reasons. It allows Wearcheck to monitor maintenance and topping up procedures. If the oil in use

differs from what is given on the sub form this may indicate a problem in the workshop or plant where personnel may be using the incorrect lubricants and training may be required. It is quite easy to determine what an oil **is not** but quite a bit harder to determine what an oil **is**. This is because a typical range of mineral oils, say the Sasol Beril range which includes multi-purpose gear and transmission oils, looks exactly the same as the Caltex Torquefluid range which also includes gear and transmission oils. This is because they both consist of crude mineral oil refined to approximately the same degree and a virtually identical additive package. There are only a handful of companies that produce oil additive packages. This means that based on viscosity and spectrometric analysis alone you cannot distinguish a Sasol Beril 220 from a Caltex Torquefluid 454.

With all the many makes and models of components in existence it is impossible to have access to all the manufacturers' recommendations. This can often be information that is surprisingly difficult to get from the OEMs so knowing what oil should be in use helps to ensure that the right product is being used in the right place.

Knowing the oil capacity of the sump can sometimes help avoid an embarrassing diagnosis. If the oil is contaminated with dirt or water and the sump capacity is only 20 litres there will be no problem in draining and flushing out the system. If the sump contains 2000 litres then maybe the correct course of action would be to centrifuge, filter or purify the oil. In this way, knowing how much oil is in the system could potentially affect the quality of the diagnosis.

Lastly, there is space to record if an oil additive or coolant conditioner are in

use. The use of an oil additive may explain an unexpected laboratory result although these products are generally not detectable. In the case of coolant conditioners, these contain chemicals that may end up in the oil if there is an internal coolant leak.

That covers the top and bottom sections on the front of the sub form, what information is required, why it is required and what might go wrong if the information is missing or incorrect. The middle section, which deals with sample information, will be covered in Part Two of this technical bulletin.

The back of the sub form contains brief instructions on how to take an oil sample. Poor sampling technique is the second biggest problem where oil analysis programmes are concerned and this topic will be covered in a subsequent technical bulletin. The back of the sub form also contains Wearthcheck's standard conditions of issue of report.

the lives of the diagnosticians immeasurably better. The sub form comes as a self-carboning duplicate, the top copy is for the laboratory and the bottom copy is for the customer's records. Please, please keep these copies. Wearthcheck processes nearly 2 000 samples per day and between 35 and 40 thousand samples per month. There are over 4 million samples on the database. Finding a sample without the sample number can be like looking for a needle in a haystack. Depending on how much other information is or is not available such as customer code, sample date, vehicle ID, it may in fact be impossible to locate the sample. If you do telephone the department to discuss a sample please quote the sample number so that the data can be accessed immediately.

Remember, the more information that Wearthcheck has, the better the service that can be offered and the more effective the oil analysis programme will be. Complete and correct information also speeds up processing time, which will lead to improved, overall turnaround time.

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CONCLUSION

There is one final point to be made and, if this can be implemented, it will make

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