Twinning Project EE2003/IB/EN/03
CHRIS number 2003/005-026.09.02

Final report
Part II

Development of Estonian Fuel Quality Management System

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Final report

Part II



MINISTRY OF THE ENVIRONMENT

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

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1 Content

2. Introduction

2.1 Starting points

The second part of final report on Development of Estonian Fuel Quality Management System (FQMS) is continuing the first part. For consistency it applies the nomenclature and numeric system used in first part. Therefore the repetition of issues can be avoided or reduced to references.

With reference to first part of final report and the issue in subchapter 2.5.6 Continuing activities this is the starting point for final report second part.

The results of all activities to be covered by the second part will be subject of this report:

- Training on generation of good quality data;
- Training on management of fuel test facilities;
- Training on multifunctional fuel laboratory equipment, octane and cetane measuring engines;
- Future training system;
- Additional support to implement the IT based information system for institutions concerned;
- Additional support to implement fuel data system;
- Additional support to raise public awareness for fuel quality;
- Participation of the Estonian Environmental Research Centre (EERC) in a round robin exercise on testing fuel quality organized by FAM;
- Accreditation and certification by German and Estonian accreditation authorities.

Last but not least point will be a summary overview on Estonian fuel quality monitoring activities which were performed in conformity with Directive 98/70/EC with some adjustments to Estonian circumstances. This report will be titled as Estonian fuel quality monitoring activities in 2005-2006.

2.2 Conclusions

2.2.1 Component C. Training

General description

The training activities focused on training on the spot in the new fuel laboratory in EERC. All training needs were identified in first part of final report (see also 5.1.1.1 of first part).

With reference to first part of final report the training plans for different training units were kept flexible depending on the progress being made with installation of equipment in the fuel lab located in Suur-Sõjamäe street in Tallinn.

Objective of these training activities was to acquire the capability to apply all standard test methods of the European standard EN 228 for gasoline and EN 590 for diesel as required.

These methods are designed to analyse the samples taken in conformity with European standards EN 14274 and EN 14275. The results will indicate whether the quality of fuels of Estonia will comply with the parameters for fuel quality set by Directive 98/70/EC.

With regard to the content of tasks and methods to analyse reference is made to first part of final report 7.1.1 and 7.1.1.1.

The Estonian Environmental Research Centre has the future task to analyse fuel samples taken in context of national fuel quality monitoring.

Continuing activities covered in this report are C4 Training on generation of good fuel quality data, C5 Training on interpretation of fuel test results, C6 Training on management of fuel test facilities, C7 Training on multifunctional lab equipment: certification/classification of fuels and C9 Future training system.

Results

In accordance with the relevant standards (see also 7.1.1 of first part) for the method of analysis the training took place in a fuel lab and in a separate room where fuel engine tests were carried out.

The fuel lab staff of EERC was trained on the new equipment required to perform analyses in the context of the fuel quality monitoring system.

Two different staff members of EERC were trained to run the special engines designed to identify the proper octane or cetane number.

At the end the EERC fuel laboratory staff was trained properly. The acquired capabilities of the staff were appreciated by comparing the results of their performance with results of other labs basing on the same referential material.

Finally the skilled staff of the EERC is well prepared to analyse fuel samples in conformity with the relevant standardized methods. They meet the requirements to analyse fuel samples according to the requirements of FQMS.

2.2.2 Component D. Information Technology

General description

With reference to first part of final report activity D3 Electronic data provision and reporting schemes required ongoing support with regard to develop the EERC Laboratory Information Management System (LIMS) concerning the data base covering all information required by Estonian institutions to proceed with FQMS.

The data base has to cover several virtual sets of data:

- all filling stations operating in Estonia;
- all filling stations monitored by FQMS per anno;
- all filling stations linked to results of monitoring;
- all filling stations to be monitored in the upcoming year;
- annual consumption of gasoline in terms of grades;
- annual consumption of gasoline and diesel in terms of 10 ppm and 50 ppm sulphur;
- annual consumption of diesel;
- annual consumption of biofuels;
- annual consumption of light and heavy heating oil.

Due to this information the Estonian fuel quality monitoring system can be implemented. This system is to be served by an appropriate IT system. It is based on:

- a framework of user rights to have access to specified data;
- a framework of interfaces between data and between users;
- the draft for set-up of one data base being updated by different users (institutions).

With regard to the requirements for fuel data system different decisions had to be prepared.

Additional activities supporting fuel data system in the frame of activity D3 are based on activities B4 Further activities in the area of compliance, B5 Co-operation with the oil industry in Estonia and B6 Transparency of fuel product quality.

Results

Based on responses of questionnaires, bilateral interviews and meetings with institutions several drafts to overcome all problems were developed and agreed. These drafts will be the outset for the shape of the IT set up.

With regard to fuel data system the options were discussed.

2.2.3 Component E. Quality Assurance and Accreditation

General description

Continuing activities covered in this report are E4 Intercalibration and E5 Completion of international and local accreditation.

Two tasks of these activities will be finished in the end of 2006 at latest: intercalibration and accreditation of EERC fuel laboratory. Since these items are by nature practical rather than theoretical they are not deeply covered by this report.

Intercalibration requires participation at an international round robin test on certified referential materials. The participating international fuel labs are analysing certified fuel samples applying the standardized test methods of European standard EN 228 for gasoline and EN 590 for diesel. The results will be collected and evaluated by the leading laboratory. Deviations from the equilibrium value are tolerated to a certain amount. Test results within this zone of tolerance have passed the test and vice versa.

International and local accreditation certifies that the fuel testing procedure of this particular fuel laboratory complies with the relevant standards. After getting accreditation EERC fuel laboratory will comply with the respective requirement of European standard EN 14274 to analyse fuel samples in the context of fuel quality monitoring system.

Results

The fuel laboratory of EERC has participated at the latest international round robin test (as pre-intercalibration) arranged by German company FAM. All results were satisfying. On the basis of these good results the intercalibration and accreditation procedure has been started.

Estonian company Kvalmek carried out the certification procedure of a special organisational unit of EERC in order to authorise it to issue certificates of fuel samples in future.

2.2.4 Estonian fuel quality monitoring activities in 2005-2006

This summary report covers the activities of Estonian fuel quality management which resulted on the respective Twinning project activities.

As agreed by the Estonian Ministry of Environment (MoE) the Estonian Environmental Research Center (EERC) took over the management on fuel quality monitoring. EERC´s first task was to implement electronically the register of all Estonian filling stations. The preparation of the annual report on Estonian fuel quality monitoring for 2004 to be submitted by MoE to European Commission was the next issue on the agenda. As explained in the first part of final report most reporting elements complied already with the Directive 98/70/EC. This report was submitted on time by MoE at the end of June 2005.

EERC prepared then the Estonian fuel quality monitoring for 2005. On the basis of the register on filling stations the minimum amount of 400 spots to take samples according to European standard EN 14274 were chosen. The lot of samples was split into 200 samples for summer period and 200 for winter time. EERC took the samples for summer period in the months from July to September in line with the rules. The samples for winter time were drawn in December 2005. The analyses of the samples were finished early in 2006 in the fuel lab of EERC. A different lab substituted EERC in those analytical methods for which no accreditation was available.

In 2005 the EERC invited all Estonian institution involved in fuel quality monitoring and created a committee to harmonize all fuel monitoring activities for 2006, especially the sample taking. The plan for 2006 on automotive fuels, heating oil, marine fuels and biofuels was prepared.

With regard to the development of IT based fuel quality monitoring system a decision on a unified fuel database serving all institutions was made. The fuel database should be placed at the Environmental Information Centre (EIC). Decision was also taken on the required reporting for 2006. In this context the selection of filling station to monitor in 2006 was done.

Finally the EERC prepared the Estonian fuel quality monitoring report for 2005. The report was submitted on time by MoE to European Commission.

EU Fuel Quality Monitoring Submissions – 2005 Reporting Template

Introduction, purpose & format

Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Directive 93/12/EEC, as last amended by Directive 2003/17/EC, sets the environmental specifications for all petrol and diesel fuel marketed in the European Union. These specifications can be found in Annexes I to IV of the Directive. Article 8(1) obliges the Member States to monitor the compliance with these fuel quality specifications according to the analytical measurement methods referred to in the Directive.

By no later than 30 June each year the Member States must submit a summary of the fuel quality monitoring data collected during the period January to December of the previous calendar year. The first report was to be made by 30 June 2002, in the format specified under Commission Decision 2002/159/EC. From 2004 Member States are required to report according to the requirements of the European standard EN 14274: 2003, unless they are using national fuel quality monitoring systems of equivalent confidence. In addition from 2005 Member States are required to phase in "sulphur free" petrol and diesel fuels on an appropriately balanced geographical basis. To support this revised reporting a 'Common Format for the Submission of Summaries of National Fuel Quality for Petrol and Diesel from 2004' was proposed & agreed with Member States.

Member State submissions providing the results of monitoring for years 2001 and 2002 have been summarised in the EU Fuel Quality Monitoring 2001 and 2002 Summary Reports. In these reports an electronic format for submissions was recommended, together with additional information to assist in the collation and interpretation of results. The common reporting format for 2005 reporting onwards contained herein is proposed to attempt to harmonise reporting submissions across the Member States whether they are using either the European standard or their own national systems. This format essentially summarises information already required or requested under the Directive and European standard. The purpose of this extended Excel template based upon the format for reporting from 2005 is to:

- Assist Member States in their data reporting;
- Facilitate the collation and interpretation of Member State submissions, reducing the need to return to Member States for additional information;
- Provide additional guidance to Member States on the provision of information that would assist in the interpretation/understanding of both their national fuel quality monitoring systems and the significance of the results of sample analysis in the annual EU Fuel Quality Monitoring Summary Report.

The format of this template broadly follows that of the common format for reporting from 2004; mandatory requirements outlined in the Directive/European standard, which are denoted by black text/light blue fields, text and fields in red/orange are additional information requested beyond these (such as specific information on the availability of sulphur free fuels, or the national monitoring system where EN 14274:2003 is not used).

Your assistance in providing submission data using this Excel template is greatly appreciated.

Additional Information Fields

1. Description of fuel quality monitoring system.

The additional optional information requested serves several purposes, firstly in clarifying the location/method of sample collection and analysis; second to help put into context/explain the reasons

for differences in national fuel quality monitoring systems; in particular the number of samples taken and location of sampling:

a) The number of sources fuels and distribution pathways (i.e. number of refineries, imported fuel sources and major distribution terminals) will affect the total number of samples needed to ensure a similar degree of statistical confidence in how representative monitoring results are of national fuel quality;
b) Sampling at the end of the distribution chain (i.e. dispensing/refuelling sites) ensures that any contamination is identified before it reaches the vehicle, whilst sampling the whole distribution chain will also help identify at what point any potential contamination might have occurred.

2. Sales and availability.

The additional optional information requested serves to help clarify EU picture of the rate of introduction of low (<50 ppm) and zero (<10 ppm) sulphur petrol and diesel.

3. Petrol and Diesel sample analysis reporting tables

- Separate tables are requested for different RON and different sulphur grades in order to identify any particular issues with different fuel types;
- Additional clarifying information is requested to help interpret correctly the significance of any exceedances of the limit values and allow Member States the opportunity to provide information on how such a potential exceedances are followed up.

Help on completing the Form

If you have any queries, regarding this Excel reporting template, please do not hesitate to call or e-mail Nikolas Hill of AEA Technology on: Tel: +44 (0)870 190 6490; E-mail: nikolas.hill@aeat.co.uk

Thank you again for your assistance with this work.

Directive 98/70/EC: Test Methods, Limit Values and Tolerance Limits*

Petrol

*Based on information provided by the German Environmental Protection Agency, Italy, Irish EPA, UK DTI and CEN TC19

Parameter	Unit	98/70/EC		Test specified in 98/70/EC or EN 228:1999				
		Limit values		Method	Date	Reproducibility, R*	Tolerance limits (95% confidence)	
		Min.	Max.				Min.	Max.
Research Octane Number (RON)	--	95		EN-ISO 5164	2005	0,7	94,6	
(RON 91 fuel only)	--	91		EN-ISO 5164	2005	0,7	90,6	
Motor Octane Number (MON)	--	85		EN-ISO 5163	2005	0,9	84,5	
(RON 91 fuel only)	--	81		EN-ISO 5163	2005	0,9	80,5	
Vapour Pressure, DVPE								
--summer period (normal)	kPa		60	EN 13016-1	2000	3,0		61,8
--summer period (arctic or severe weather conditions)	kPa		70	EN 13016-1	2000	3,2		71,9
Distillation*								
--evaporated at 100 °C	% (v/v)	46		EN-ISO 3405	2000	4,0	43,6	
-- evaporated at 150 °C	% (v/v)	75		EN-ISO 3405	2000	4,0	72,6	
Hydrocarbon analysis								
-- Olefins	% (v/v)		18,0	ASTM D1319	95a	4,6		20,7
*without oxygenates			18,0	ASTM D1319*	95a	6,5		21,8
			18,0	EN 14517	2004	2,6		19,5
-- Olefins (RON 91 fuel only)	% (v/v)		21,0	ASTM D1319	95a	5,1		24,0
			21,0	EN 14517	2004	3,0		22,8
-- Aromatics (up to 2004)	% (v/v)		42,0	ASTM D1319	95a	3,7		44,2
			42,0	EN 14517	2004	2,0		43,2
-- Aromatics (from 2005)			35,0	ASTM D1319	95a	3,7		37,2
			35,0	EN 14517	2004	1,7		36,0
-- Benzene	% (v/v)		1,0	EN 12177	1998	0,10		1,06
			1,0	EN 238	1996	0,17		1,10
			1,0	EN 14517	2004	0,05		1,03
Oxygen content	% (m/m)		2,7	EN 1601	1997	0,3		2,9
Oxygenates								
-- Methanol	% (v/v)		3	EN 1601	1997	0,4		3,2
-- Ethanol	% (v/v)		5	EN 1601	1997	0,3		5,2
-- Iso-propyl alcohol	% (v/v)		10	EN 1601	1997	0,9		10,5
-- Tert-butyl alcohol	% (v/v)		7	EN 1601	1997	0,6		7,4
-- Iso-butyl alcohol	% (v/v)		10	EN 1601	1997	0,8		10,5
-- Ethers with 5 or more carbon atoms per molecule	% (v/v)		15	EN 1601	1997	1		15,6
-- other oxygenates	% (v/v)		10	EN 1601	1997	0,8		10,5
Oxygen content	% (m/m)		2,7	EN 13132	2000	0,3		2,9
Oxygenates								
-- Methanol	% (v/v)		3,0	EN 13132	2000	0,3		3,2
-- Ethanol	% (v/v)		5,0	EN 13132	2000	0,4		5,2
-- Iso-propyl alcohol	% (v/v)		10,0	EN 13132	2000	0,8		10,5
-- Tert-butyl alcohol	% (v/v)		7,0	EN 13132	2000	0,5		7,3
-- Iso-butyl alcohol	% (v/v)		10,0	EN 13132	2000	0,8		10,5
-- Ethers with 5 or more carbon atoms per molecule	% (v/v)		15,0	EN 13132	2000	1		15,6
-- other oxygenates	% (v/v)		10,0	EN 13132	2000	0,8		10,5

Parameter	Unit	98/70/EC		Test specified in 98/70/EC or EN 228:1999				
		Limit values		Method	Date	Reproducibility, R*	Tolerance limits (95% confidence)	
		Min.	Max.				Min.	Max.
Sulphur content	mg/kg		150	EN ISO 14596	1998	30		168
			150	EN ISO 8754	1995			
			150	EN 24260	1994	18,6		161
			150	EN ISO 20846	2004	25,6		165,1
			150	EN ISO 20847	2004	27,7		166,3
			150	EN ISO 20884	2004	15,9		159,4
Sulphur content (low sulphur, from 2005)	mg/kg		50	EN ISO 14596	1998	20		62
			50	EN 24260	1994	74,6		54
			50	EN ISO 20846	2004	9,7		55,7
			50	EN ISO 20847	2004	16,6		59,8
			50	EN ISO 20884	2004	7,9		54,7
Sulphur content (sulphur free, from 2005)	mg/kg		10	EN ISO 14596	1998	5		13
			10	EN 24260	1994	20,3		12
			10	EN ISO 20846	2004	2,7		11,6
			10	EN ISO 20884	2004	3,1		11,8
Lead content	g/l		0,005	EN 237	1996	0,002		0,0062
			0,005	EN 237	2004	0,00062		0,0054

* R values and limits are fixed precision statements provided by CEN, to be used in the absence of specific values from Member States. Member States may use and report their own defined R depending on their testing conditions.

Diesel

Parameter	Unit	98/70/EC		Test specified in 98/70/EC or EN 228:1999				
		Limit values		Method	Date	Reproducibility, R*	Tolerance limits (95% confidence)	
		Min.	Max.				Min.	Max.
Cetane number	--	51,0	--	EN-ISO 5165	1998	4,3	48,5	
Density at 15 °C	kg/m³		845	EN-ISO 3675	1998	1,2		845,7
				EN ISO 12185	1996	0,5		845,3
Distillation -- 95% Point	°C		360	EN-ISO 3405	2000	10,0		365,9
Polycyclic aromatic hydrocarbons	% (m/m)		11	IP 391	1995	3,8		13,2
Sulphur content	mg/kg		350	EN ISO 14596	1998	50,0		379,5
			350	EN 24260	1994	550,8		375,0
			350	EN ISO 20846	2004	40,0		373,6
			350	EN ISO 20847	2004	17,9		360,6
			350	EN ISO 20884	2004	30,9		368,2
Sulphur content (low sulphur, from 2005)	mg/kg		50	EN ISO 14596	1998	20,0		62
			50	EN 24260	1994	74,6		54,0
			50	EN ISO 20846	2004	6,7		54,0
			50	EN ISO 20847	2004	12,8		57,6
			50	EN ISO 20884	2004	7,9		54,7
Sulphur content (sulphur free, from 2005)	mg/kg		10	EN ISO 14596	1998	5,0		13,0
			10	EN 24260	1994	20,3		12,0
			10	EN ISO 20846	2004	2,2		11,3
			10	EN ISO 20884	2004	3,1		11,8

Contacts & Summary

Details of those compiling the Fuel Quality Monitoring Report
The authorities responsible for compiling the fuel quality monitoring report are requested to complete the table below.

Reporting Year:	2005
Country:	Estonia
Date Report Completed:	20 May 2005
Organisation Responsible for Report:	Ministry of Environment
Address of Organisation:	Narva 7A, Tallinn, Estonia
Person Responsible for Report:	Viktor Grigorjev
Telephone Number:	(372) 6262 986
Email:	viktor.grigorjev@envir.ee

DEFINITIONS AND EXPLANATION

Parent fuel grade: Directive 98/70/EC sets the environmental specifications for petrol and diesel fuel marketed in the EU. The specifications in the Directive can be thought of as 'parent fuel grades'. These include (i) regular unleaded petrol (RON > 91), (ii) unleaded petrol (RON > 95) and (iii) diesel fuel.

National fuel grade: Member States may, of course, define 'national' fuel grades which must still, however, respect the specification of the parent fuel grade. For example, national fuel grades may comprise super unleaded petrol (RON > 98), lead replacement petrol, zero sulphur petrol, <50 ppm sulphur petrol, zero sulphur diesel, <50 ppm sulphur diesel, etc.

Zero sulphur or sulphur-free fuels are petrol and diesel fuels that contain less than 10 mg/kg (ppm) of sulphur.

SUMMARY REPORTING FORMAT FOR PETROL & DIESEL

Member States are requested to provide a brief general summary of the results of the year's monitoring, including information on any:

- other parameters measured;
- exclusions;
- further details on breaches of parameter tolerance limits (i.e. number of samples, values);
- enforcement actions taken as a result of breaches of the limit values/tolerance limits; and
- additional information deemed relevant.

In particular, Member States should provide additional explanatory information on reasoning for exceptional cases where exclusions are made, such as:

- fuel grades marketed in very small quantities;
- mandatory fuel parameters that are not measured;
- geographical areas that are left outside the monitoring programme;
- exceptionally high or low values of analytical results (i.e. outliers).

General Summary of Analysis and Additional Information:
Estonian Environment Research Centre (EERC) is managing the FQMS and reporting the results. The monitoring followed the European standard EN 14274. The sample-taking followed the European standard EN 14275. Analyses were partly done in the laboratory of EERC, partly in a private laboratory, and the applied methods had accreditation.

Fuel Quality Monitoring System

Year: **2005**

Description of Fuel Quality Monitoring System

Member States should provide details on the operation of their national fuel quality monitoring systems.
Directive 98/70/EC requires the vapour pressure of petrol to be less than 60.0 kPa during the summer period, which spans 1 May until 30 September. However, for those Member States that experience 'arctic or severe weather conditions' the summer period covers the period 1 June to 31 August and the vapour pressure must not exceed 70 kPa. Member States are requested to define the Summer/Winter periods implemented in their territories and also applying to their fuel quality monitoring system reporting.

Definition of Monitoring System Summer and Winter Periods:

Summer Period	
Start	1 May
End	30 Septmber
Winter Period	
Start	1 December
End	28/29 February

* Normal = 1st May to 30th September; Arctic = 1st June to 31st August

Member States should indicate whether their monitoring system is set up using the European standard EN 14274:2003 statistical model A, B or C and whether it is based on the large or small country framework. Alternatively, the Member State should indicate if they are using their own nationally defined system.

Country Size (L = Large, S = Small)	S		
		Minimum number of samples each period (Petrol, per grade; Diesel)	
Fuel Quality Monitoring System model used:	Yes / No	Small Country	Large Country
EN 14274 Statistical Model A		50	100
EN 14274 Statistical Model B		100	200
EN 14274 Statistical Model C	yes	50	--
National System		--	--

If Member States **are** using the European standard EN 14274:2003, they should also provide details on the sampling programme by completing the relevant sections of the table in Annex I (as defined in Annexes B and C of EN 14274:2003), plus details of any additional provisions made in the table below.

"If Member States **are not** using the European standard EN 14274:2003 and are using their own national system, they should provide a description of the operation of their national fuel quality monitoring systems. This should preferably include the following information, in addition to any additional information that the Member State thinks is relevant (e.g. number of national refineries & distribution terminals):

- Organisations responsible for sampling, analysis and reporting;
- Types of locations at which sampling is carried out (e.g. refineries, terminals/depots, or from refuelling stations);
- Frequency of sampling and selection of sampling points;
- Assessment that shows the monitoring system's equivalency to the CEN system."

Description of National Fuel Quality Monitoring System (give once and up-date if necessary):
Not applicable.

Total Sales of Petrol and Diesel

Year: **2005**

Member states are requested to complete the following table, as applicable detailing the quantities of each type and grade of petrol and diesel fuel marketed in their territory.

***NB: Please do not report national fuel grade sales under more than one category.**

Fuel Grade	Name of national fuel grade	National sales total		No. Samples Taken
		Litres	Tonnes	
Regular unleaded petrol (minimum RON = 91)[1]				
Regular unleaded petrol (minimum RON = 91 & < 50 ppm Sulphur)	pliivaba bensiin (RON 91)		10 000	
Regular unleaded petrol (minimum RON = 91 & < 10 ppm Sulphur)	väävli- ja pliivaba bensiin (RON 91)		4000	
Unleaded petrol (minimum RON = 95)[1]				
Unleaded petrol (minimum RON = 95 & < 50 ppm Sulphur)[2]				
Unleaded petrol (minimum RON = 95 & < 10 ppm Sulphur)[3]				
Unleaded petrol (minimum 95 =< RON < 98)				
Unleaded petrol (minimum 95 =< RON < 98 & < 50 ppm Sulphur)	pliivaba bensiin (RON 95)		130 000	
Unleaded petrol (minimum 95 =< RON < 98 & < 10 ppm Sulphur)	väävli- ja pliivaba bensiin (RON 95)		89 000	
Unleaded petrol (minimum RON >= 98)				
Unleaded petrol (minimum RON >= 98 & < 50 ppm Sulphur)	pliivaba bensiin (RON 98)		32 000	
Unleaded petrol (minimum RON >= 98 & < 10 ppm Sulphur)	väävli- ja pliivaba bensiin (RON 98)		26 300	
Total unleaded petrol (<150 ppm Sulphur)				
Total unleaded petrol (<50 ppm Sulphur)	**pliivaba bensiin**		**172000**	
Total unleaded petrol (<10 ppm Sulphur)	**väävli- ja pliivaba bensiin**		**119300**	
Total Petrol	**bensiin**		**291300**	**300**
Diesel fuel[4]				
Diesel fuel (< 50 ppm sulphur)[5]	diisel		98 200	
Diesel fuel (< 10 ppm sulphur)[6]	väävlivaba diisel		189 500	
Total Diesel	**diisel**		**287700**	**114**

[1] as specified in Annex I of Directive 98/70/EC
[2] as specified in Annex III of Directive 98/70/EC
[3] as specified in Annex III of Directive 98/70/EC except the sulphur content which must be less than 10ppm
[4] as specified in Annex II of Directive 98/70/EC
[5] as specified in Annex IV of Directive 98/70/EC
[6] as specified in Annex IV of Directive 98/70/EC except the sulphur content which must be less than 10ppm

Comments (completeness of data, particular issues, etc.)

Geographical Availability of Sulphur-Free Fuels

Year:	2005

Member States are requested to complete the following tables with basic information on the geographical availability of sulphur free petrol and diesel sold in their territories.

	(Litres/Tonnes)	% Total Petrol/Diesel Sales
Total National sales <10 ppm sulphur petrol	119 300 t	41%
Total National sales <10 ppm sulphur diesel	189 500 t	65,90%

Details of petrol RON grades available with <10 ppm sulphur:
Are <10 ppm sulphur fuels (petrol and/or diesel) labelled differently from regular grades (i.e. can they be easily distinguished from regular/higher sulphur fuels by the consumer)?
Yes

Where Member States choose to apply the measures in their national territories, they are also requested to complete, as far as possible, the following tables with detailed information (Options A to D) on the geographical availability of sulphur free petrol and diesel in their territories, as outlined in the Commission Guidance note[1]. Member States should also take into account any specific provisions made for special cases in the Commission Guidance.

[1] The more detailed reporting on geographical availability is not needed until the 2005 monitoring reports, but would be useful if Member States were also able to provide it from 2004.

Where the more detailed information is not available, or additional notes/clarifications are needed or other guidance than that given by the Commission is used, the Member States are requested to provide a description on the extent to which sulphur free fuels are marketed in their territory (i.e. geographical availability). This free form text box should also be used to provide any additional information such as the special cases outlined in the Commission Guidance note.

Description of the geographical availability of sulphur free fuels or additional notes:
Due to small size of the country the filling stations are well spread according to the demand over the territory. In 2005 the average consumption of sulphur-free fuels in Estonia was 50%. There are no large refuelling stations or highway/motorway stations in Estonia.

Option (A): Proportion of refuelling stations with sulphur free grades available by region

See Annex II for reporting table format.

Option (B): Average distance between refuelling stations with sulphur free grades available

	No. Refuelling Stations		Distance between refuelling stations (km)			
	<10 ppm	All	With <10 ppm grades available			All
	Number	Number	Min.	Max.	Mean	Mean
Petrol						
Diesel						

Option (C): Availability of sulphur free fuels at large refuelling stations

	Petrol	Diesel
National criteria for definition of *"large refuelling stations"* in terms of a minimum volume throughput (in million litres / annum)		
Total number of large refuelling stations nationally		
Number of large refuelling stations with <10 ppm fuel available		
% Total large refuelling stations with <10 ppm fuel available		

Option (D): Availability of sulphur free fuels at highway/motorway refuelling stations

	Petrol	Diesel
Total number of highway/motorway refuelling stations nationally		
Number of highway/motorway refuelling stations with <10 ppm fuel available		
% Total highway/motorway refuelling stations with <10 ppm fuel available		

ANNEX I: Fuel Quality Monitoring System Regional Sampling of Petrol and Diesel[1]

Country:	Estonia
Fuel type (petrol or diesel):	Both
Statistical Model (A, B or C):[2]	C
Reporting Year:	2005
Period (Summer or Winter):	Both

Min. number of samples per grade:	50

Macro / Non-Macro Regions (add extra rows as needed)	Fuel Consumption (million tonnes)	Variability factor[3]	Proportion of total samples	Min. number of Samples per grade[4]	Actual number of samples taken					
					Grade:	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**
					Name/ID:	**RON 91**	**RON 95**	**RON 98**	**Diesel S.**	**Diesel W.**
1			-	-		**66**	**128**	**106**	**50**	**64**
2			-	-						
3			-	-						
4			-	-						
5			-	-						
6			-	-						
7			-	-						
8			-	-						
9			-	-						
10			-	-						
11			-	-						
12			-	-						
13			-	-						
14			-	-						
15			-	-						
Remainder	--	--	--	**50**						
Total						**66**	**128**	**106**	**50**	**64**

[1] As defined in Annexes B and C of EN 14274:2003
[2] Definitions according to those provided in EN 14274:2003.
[3] Only for statistical Model A
[4] For grades comprising <10% total sales, the minimum is calculated as: %sales x min. for parent grade (at least 1 sample)

Additional Notes (e.g. identification of grades comprising <10% total sales)

ANNEX II: Options (A) - Proportion of Refuelling Stations with Sulphur Free Grade Available by Region[1]

Country:	Estonia
Fuel type (petrol or diesel):	2005
Year:	
Period (Summer or Winter):	

Note:
Please fill out the orange sections with the relevant information as far as possible, inserting extra rows for additional regions as needed and with additional comments as necessary for explanation in the relevant section.

Regional Parameters				**% of refuelling stations with sulphur free fuel available[2]**		
NUTS Region Description[2]		**NUTS Code[2]**	**No. of refuelling stations**	**Minimum %**	**Maximum %**	**Mean %**
LEVEL 2 Regions	**Region Names**	--	--	**By (NUTS) level 3 region:**		
Region 1		E.g. XX11				
Region 2		E.g. XX12				
Region 3		E.g. XX13				
Region 4		E.g. XX21				
Region 5		E.g. XX22				
Region 6		E.g. XX31				
<insert extra rows as needed>						
LEVEL 1 Regions	**Region Names**	--	--	**By (NUTS) level 2 region:**		
Region 1		E.g. XX1				
Region 2		E.g. XX2				
Region 3		E.g. XX3				
<insert extra rows as needed>						
National Total		**E.g. XX**				

[1] According to the Eurostat Nomenclature of territorial units for statistics – NUTS Statistical Regions of Europe (see: http://europa.eu.int/comm/eurostat/ramon/nuts/home_regions_en.html)
[2] Additional information on NUTS, including full country code listings, may be found on the Eurostat web site at: http://europa.eu.int/comm/eurostat/ramon/nuts/home_regions_en.html

Additional Comments:
Not applicable because Estonia is a small country belonging to Model C (no regions).

Annex V: Market Fuels used in Vehicles with Spark Ignition Engines (Petrol) from 2005

Country:	Estonia
Reporting Year:	2005
Period (Summer or Winter):	both
Parent fuel grade:	unleaded petrol 95
National fuel grade:	unleaded petrol 95
Summer Period:*	1st May to 30th September (normal)

* N = 1st May to 30th September (normal) ; A = 1st June to 31st August (arctic).

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.
(2) 91 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 3.
(3) 81 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 3.
(4) 70 kPa for Member States with arctic or severe weather conditions: See 98/70/EC, Annex I, Footnotes 4 & 5.
(5) 21 for unleaded regular grade petrol: See 98/70/EC, Annex I, Footnote 6.

Reporting results

Parameter	Unit	Analytical and statistical results					Limiting Value(1)				Test method (more recent versions may also be used)	
							National Specification, if any		According to 8/70 EC			
		No Samples	Min.	Max.	Mean	Standard Deviation	Min.	Max.	Min.	Max.	Method	Date
Research Octane Number	--	234	94,8	100	96,7	1,4			95		EN 25164	2005
Motor Octane Number	--	234	84,6	88,9	86,8	1,4			85		EN 25163	2005
Research Octane Number	--	66	91,8	93,9	92,8	0,5			91 (2)		EN 25164	2005
Motor Octane Number	--	66	81,9	84,6	83,1	0,6			81 (3)		EN 25163	2005
Vapour Pressure, DVPE winter period	kPa									(4)*		
--summer period only		150	55,9	83,8	72,3	4,2	45,0*	70,0*		60,0	EN 13016-1	2000
Distillation												
-- evaporated at 100 °C	% (v/v)	257	43,6	59,2	52,6	4,1			46,0		EN ISO 3405	2000
-- evaporated at 150 °C	% (v/v)	257	81,3	89,4	85,3	1,3			75,0			
Hydrocarbon analysis												
-- Olefins	% (v/v)	220	0,8	16,5	9,9	3,7				18.0(5)	ASTM D 1319 or EN 14517	1995, 2004
-- Olefins (RON 91 fuel only)	% (v/v)	66	7,3	14,7	12	2,1				21.0(5)	ASTM D 1319 or EN 14517	1995, 2004
-- Aromatics	% (v/v)	286	25,4	40,4	31,1	1,9				42,0	ASTM D 1319 or EN 14517	1995, 2004
-- Benzene	% (v/v)	261	0,10	0,6	0,32	0,18				1,0	EN 12177, EN 238 or EN 14517	1998, 1996, 2004
Oxygen content	% (m/m)	300	0,1	2,6	1,7	0,7				2,7	EN 1601 or PrEN 13132	1997 1998

Parameter	Unit	Analytical and statistical results					Limiting Value[1]				Test method (more recent versions may also be used)	
							National Specification, if any		According to 8/70 EC			
		No Samples	Min.	Max.	Mean	Standard Deviation	Min.	Max.	Min.	Max.	Method	Date
Oxygenates												
-- Methanol	% (v/v)	300	0,1	0,8	0,1					3		
-- Ethanol	% (v/v)	300	0,1	0,3	0,1					5		
-- Iso-propyl alcohol	% (v/v)	300	0,1	1,7	0,1	0,1				10	EN 1601	1997
-- Tert-butyl alcohol	% (v/v)	300	0,1	0,7	0,1					7	Or	
-- Iso-butyl alcohol	% (v/v)	300	0,1	0,3	0,1					10	EN 13132	2000
-- Ethers with ≥5 carbon atoms / molecule	% (v/v)	300	0,1	14,4	8	4				15		
-- other oxygenates	% (v/v)	300	0,1	0,2	0,1					10		
Sulphur content (regular grades)	mg/kg	232	4	46	23,2	9,5				50	EN ISO 14596, EN 24260, EN ISO 20846, EN ISO 20847, EN ISO 20884	1998, 1994, 2004, 2004, 2004
Sulphur content (fuels sold as sulphur-free)	mg/kg	68	4	12	8,4	2,6				10	EN ISO 14596, EN 24260, EN ISO 20846, EN ISO 20884	1998, 1994, 2004, 2004
Lead content	g/l	300	<0,003	0,007	<0,003	-				0,005	EN 237	1996, 2004

Sampling frequency

Number of samples in month			
January		July	50
February		August	60
March		September	20
April		October	
May		November	
June	20	December	150
		Total	**300**

Other notes (optional):
* National specification for winter period minimum 65,0 kPa - maximum 95,0 kPa (EVS-EN 228:2004);

Test Methods and Analysis

Parameter	Unit	Test specified in 98/70/EC or EN228 (more recent versions may also be used)						Notes on exceedences		
		Method	Date	Reproducability, R	Tolerance limits		Exceeded?	No. samples	Values	Details/action taken
					Min.	Max.				
Research Octane Number (RON)	--	EN-ISO 5164	2005	0,7	94,6					
(RON 91 fuel only)	--	EN-ISO 5164	2005	0,7	90,6					
Motor Octane Number (MON)	--	EN-ISO 5163	2005	0,9	84,5					
(RON 91 fuel only)	--	EN-ISO 5163	2005	0,9	80,5					
Vapour Pressure, DVPE										
--summer period (normal)	kPa	EN 13016-1	2000	3		61,8	Yes			
--summer period (arctic or severe weather conditions)	kPa	EN 13016-1	2000	3,2		71,9	Yes	5	71,9-77,1	Authorities were informed, investigation was initiated
Distillation*										
--evaporated at 100 °C	% (v/v)	EN-ISO 3405	2000	4,0	43,6		Yes	1	43,6	Authorities were informed, investigation was initiated
-- evaporated at 150 °C	% (v/v)	EN-ISO 3405	2000	4,0	72,6					
Hydrocarbon analysis										
-- Olefins	% (v/v)	ASTM D1319	95a	4,63		20,7				
*without oxygenates		ASTM D1319*	95a	6,5		21,8				
		EN 14517	2004	2,6		19,5				
-- Olefins (RON 91 fuel only)	% (v/v)	ASTM D1319	95a	5,1		24,0				
		EN 14517	2004	3		22,8				
-- Aromatics (from 2005)		ASTM D1319	95a	3,7		37,2	Yes			
		EN 14517	2004	1,7		36,0	Yes	3	38,4-40,4	Authorities were informed, investigation was initiated
-- Benzene	% (v/v)	EN 12177	1998	0,1		1,1				
		EN 238	1996	0,2		1,1				
		EN 14517	2004	0,1		1,0				
Oxygen content	% (m/m)	EN 1601	1997	0,3		2,9				
Oxygenates										
-- Methanol	% (v/v)	EN 1601	1997	0,4		3,2				
-- Ethanol	% (v/v)	EN 1601	1997	0,3		5,2				
-- Iso-propyl alcohol	% (v/v)	EN 1601	1997	0,9		10,5				
-- Tert-butyl alcohol	% (v/v)	EN 1601	1997	0,6		7,4				
-- Iso-butyl alcohol	% (v/v)	EN 1601	1997	0,8		10,5				
-- Ethers with 5 or more carbon atoms per molecule	% (v/v)	EN 1601	1997	1		15,6				
-- other oxygenates	% (v/v)	EN 1601	1997	0,8		10,5				

Parameter	Unit	Test specified in 98/70/EC or EN228 (more recent versions may also be used)						Notes on exceedences		
		Method	Date	Reproducability, R	Tolerance limits		Exceeded?	No. samples	Values	Details/action taken
					Min.	Max.				
Oxygen content	% (m/m)	EN 13132	2000	0,3		2,9				
Oxygenates										
-- Methanol	% (v/v)	EN 13132	2000	0,3		3,2				
-- Ethanol	% (v/v)	EN 13132	2000	0,4		5,2				
-- Iso-propyl alcohol	% (v/v)	EN 13132	2000	0,8		10,5				
-- Tert-butyl alcohol	% (v/v)	EN 13132	2000	0,5		7,3				
-- Iso-butyl alcohol	% (v/v)	EN 13132	2000	0,8		10,5				
-- Ethers with 5 or more carbon atoms per molecule	% (v/v)	EN 13132	2000	1,0		15,6				
-- other oxygenates	% (v/v)	EN 13132	2000	0,8		10,5				
Sulphur content (low sulphur, from 2005)	mg/kg	EN ISO 14596	1998	20,0		61,8				
		EN 24260	1994	6,8		54,0				
		EN ISO 20846	2004	9,7		55,7				
		EN ISO 20847	2004	16,6		59,8				
		EN ISO 20884	2004	7,9		54,7				
Sulphur content (sulphur free, from 2005)	mg/kg	EN ISO 14596	1998	5,0		13,0				
		EN 24260	1994	3,4		12,0				
		EN ISO 20846	2004	2,7		11,6	Yes	5	11,6-12,0	Authorities were informed, investigation was initiated
		EN ISO 20884	2004	3,1		11,8	Yes			
Lead content	g/l	EN 237	1996	0,002		0,0062	Yes	1	0,007	Authorities were informed, investigation was initiated
		EN 237	2004	0,00062		0,0054				

Annex VI: Market Fuels used in the Compression Ignition Engines (Diesel) from 2005

Country:	Estonia
Reporting year:	2005
Period (Summer or Winter):	Summer
Parent fuel grade:	diesel
National fuel grade:	diesel

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.
(2) In cases of dispute EN ISO 3675: 1998 shall be used
(3) Polycyclic aromatic hydrocarbons are defined as the total aromatic hydrocarbon content less than the mono-aromatic hydrocarbons content, both as determined by IP 391
(4) In cases of dispute EN ISO 14596: 1998 shall be used

Reporting Results

Parameter	Unit	Analytical and statistical results					Limiting value(1)				Test method (more recent versions may also be used)	
							National Specifications		According to 98/70/EC			
		No Samples	Min.	Max.	Mean	Standard deviation	Min.	Max.	Min.	Max.	Method	Date
Cetane number	--	50	50,4	54,9	51,9	0,8			51,0	--	EN ISO 5165	1998
Density at 15 °C(2)	kg/m³	50	827	844	839	5				845	EN ISO 3575, EN ISO 12185	1998, 1996
Distillation -- 95-%-Point	°C	50	319	360	355	7				360	EN ISO 3405	2000
Polycyclic aromatic hydrocarbons (PAH)(3)	% (m/m)	50	0,9	4	2,3	0,8				11	IP 391	1995
Sulphur content (regular grades)	mg/kg	50	20	114	39,2	13,5				50	EN ISO 14596, EN 24260, EN ISO 20846, EN ISO 20847, EN ISO 20884	1998, 1994, 2004, 2004, 2004
Sulphur content (fuels sold as sulphur-free)	mg/kg									10	EN ISO 14596, EN 24260, EN ISO 20846, EN ISO 20884	1998, 1994, 2004, 2004

Sampling Frequency

Number of samples in month			
January		July	20
February		August	10
March		September	10
April		October	
May		November	
June	10	December	
		Total	**50**

Other notes (optional):

Test Methods and Analysis

Parameter	Unit	Test specified in 98/70/EC or EN590 (more recent versions may also be used)						Notes on exceedences		
		Method	Date	Reproducability, R	Tolerance limits		Exceeded?	No. samples	Values	Details/action taken
					Min.	Max.				
Cetane number	--	EN-ISO 5165	1998	4,3	48,5					
Density at 15 °C	kg/m^3	EN-ISO 3675	1998	1,2		845,7				
		EN ISO 12185	1996	0,51		845,3				
Distillation -- 95% Point	°C	EN-ISO 3405	2000	10,0		365,9				
Polycyclic aromatic hydrocarbons	% (m/m)	IP 391	1995	3,8		13,2				
Sulphur content (low sulphur, from 2005)	mg/kg	EN ISO 14596	1998	20,0		61,8	Yes			
		EN 24260	1994	6,8		54,0	Yes			
		EN ISO 20846	2004	6,7		54,0	Yes			
		EN ISO 20847	2004	12,8		57,6	Yes	1	114	Authorities were informed, investigation was initiated
		EN ISO 20884	2004	7,9		54,7	Yes			
Sulphur content (sulphur free, from 2005)	mg/kg	EN ISO 14596	1998	5,0		13,0				
		EN 24260	1994	3,4		12,0				
		EN ISO 20846	2004	2,2		11,3				
		EN ISO 20884	2004	3,1		11,8				

Annex VI: Market Fuels used in the Compression Ignition Engines (Diesel) from 2005

Country:	Estonia
Reporting year:	2005
Period (Summer or Winter):	Winter
Parent fuel grade:	diesel
National fuel grade:	winter diesel

(1) The limiting values are "true values" and were established according to the procedures for limit setting in EN ISO 4259:1995. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259:1995.
(2) In cases of dispute EN ISO 3675: 1998 shall be used
(3) Polycyclic aromatic hydrocarbons are defined as the total aromatic hydrocarbon content less than the mono-aromatic hydrocarbons content, both as determined by IP 391
(4) In cases of dispute EN ISO 14596: 1998 shall be used

Reporting Results

Parameter	Unit	Analytical and statistical results					Limiting value(1)				Test method (more recent versions may also be used)	
							National Specifications		According to 98/70/EC			
		No Samples	Min.	Max.	Mean	Standard deviation	Min.	Max.	Min.	Max.	Method	Date
Cetane number	--	64	50,1	52,3	51,2	0,6			51,0	--	EN ISO 5165	1998
Density at 15 °C(2)	kg/m³	57	823	83,6	831	4				845	EN ISO 3575, EN ISO 12185	1998, 1996
Distillation -- 95-%-Point	°C	51	293	344	315	10				360	EN ISO 3405	2000
Polycyclic aromatic hydrocarbons (PAH)(3)	% (m/m)	64	0,6	6,2	2,4	1,2				11	IP 391	1995
Sulphur content (regular grades)	mg/kg	25	12	45	19,9	8,6				50	EN ISO 14596, EN 24260, EN ISO 20846, EN ISO 20847, EN ISO 20884	1998, 1994, 2004, 2004, 2004
Sulphur content (fuels sold as sulphur-free)	mg/kg	39	10	12	10,3	0,7				10	EN ISO 14596, EN 24260, EN ISO 20846, EN ISO 20884	1998, 1994, 2004, 2004

Sampling Frequency

Number of samples in month			
January		July	
February		August	
March		September	
April		October	
May		November	
June		December	64
		Total	**64**

Other notes (optional):

Test Methods and Analysis

Parameter	Unit	Test specified in 98/70/EC or EN590 (more recent versions may also be used)						Notes on exceedences		
		Method	Date	Reproducability, R	Tolerance limits		Exceeded?	No. samples	Values	Details/action taken
					Min.	Max.				
Cetane number	--	EN-ISO 5165	1998	4,3	48,5					
Density at 15 °C	kg/m^3	EN-ISO 3675	1998	1,2		845,7				
		EN ISO 12185	1996	0,51		845,3				
Distillation -- 95% Point	°C	EN-ISO 3405	2000	10,0		365,9				
Polycyclic aromatic hydrocarbons	% (m/m)	IP 391	1995	3,8		13,2				
Sulphur content (low sulphur, from 2005)	mg/kg	EN ISO 14596	1998	20,0		61,8				
		EN 24260	1994	6,8		54,0				
		EN ISO 20846	2004	6,7		54,0				
		EN ISO 20847	2004	12,8		57,6				
		EN ISO 20884	2004	7,9		54,7				
Sulphur content (sulphur free, from 2005)	mg/kg	EN ISO 14596	1998	5,0		13,0				
		EN 24260	1994	3,4		12,0				
		EN ISO 20846	2004	2,2		11,3	Yes			
		EN ISO 20884	2004	3,1		11,8	Yes	4	12	Authorities were informed, investigation was initiated

3. Component C. Training

Continuing activities covered in this report are C4 Training on generation of good fuel quality data, C5 Training on interpretation of fuel test results, C6 Training on management of fuel test facilities, C7 Training on multifunctional lab equipment: certification/classification of fuels and C9 Future training system.

After arrival of fuel laboratory equipment these activities started. Two short time experts (STE) Harald Vogel and Peter Wilcken trained the EERC fuel laboratory staff.

3.1 Activity C5. Training on interpretation of fuel test results

In June 2005 a training seminar took place in the EERC. During this seminar the characteristics of gasoline and diesel were presented. The lectures included a description of the sample types and these general standards and specifications that the fuel has to meet. All analytical methods were presented in detail, including the limits of specification (see also 5.1 and 5.2 of first part).

The lectures appealed to an audience of analytical operators, inspectorate and governmental staff. In May 2006 the topic was upgraded especially to laboratory staff and to laboratory aspects. Main intention of this part of activity C5 Training on interpretation of test results, was an initial sensitisation to usual and to unusual values.

Special items were:

- typical values of results;
- unusual results;
- off spec results and a plan of "trouble shooting";
- dimensioning of calibration series to cover all expected values up to the specification limits.

Examples:

1. The content of oxygenates in gasoline is specified in EN 228. The concentration of ether compounds as ETBE or MTBE is allowed up to a total of 15 % (v/v). These are usual values, supplier use the specification range very often up to the limit. On the other hand alcohols as 2-propanol or n-butanol are allowed to single concentrations of up to 10 % (v/v), values which are extremely unusual.
2. The permissible range of the density is 720 to 775 kg/m³ at 15 °C. Since the aromatic content is restricted to a limit of 35 % (v/v), the samples close to the upper limit of the density became very uncommon. Even if such a sample is in spec concerning the density there is still a suspicion that other parameters may be off spec.

3.1.1 Adaptation of specification limits to laboratory work

In case of calibration at least two test samples should be used. One sample with "typical" values and another with values close to the specification limits. If those samples are not available create them by using of pure chemicals (e.g. flash point) or a composition of samples or sample plus an "in spec" sample plus pure chemical.

Example:

Sulphur-content in diesel: The determination of the sulphur content in fuel with the XFA is sensitive to the matrix of the sample. To calibrate and to test this method, you first blend a high boiling sulphur free hydrocarbon with a sulphuric compound. Later, you can either blend diesel with a sulphuric compound or you can blend diesel with heating oil with a well-known sulphur content (Round-Robin sample) which normally has a sulphur content of up to 0,2 % (m/m).

In the middle of July 2006 about 50 test samples arrived in Tallinn. All samples have already been analysed before, the results are given. With these samples the equipment can be tested "under real conditions" and the laboratory staff can be trained and can get a feeling for usual and unusual values.

3.1.2 Conclusion

The training on the interpretation of test results was successful. The members of laboratory staff have first impressions of typical fuel test results. Nevertheless especially the training on usual and unusual results has to and will go on. The item will be integrated in the plans for future training systems (activity C9).

3.2 Activities C4 Training on generation of good fuel quality data and C6 Training on management of fuel test facilities

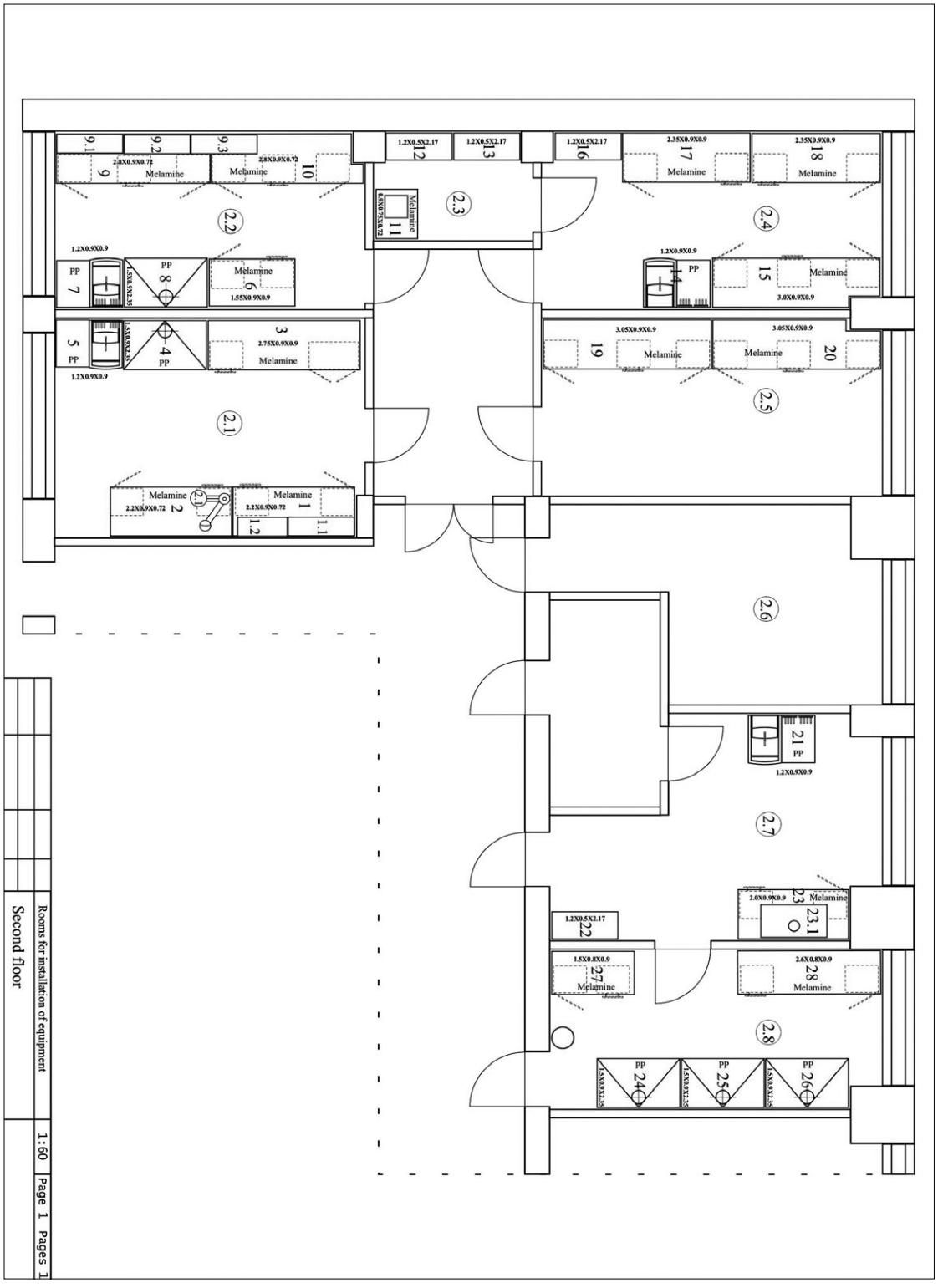
The training on the management of fuel test facilities mainly covered the following aspects:

- layout of the laboratory and positioning of the analytical devices;
- work flow diagram for fuel samples;
- training on analytical devices;
- calibration, usual and unusual results, off spec results, trouble shooting.

3.2.1 Layout of the positioning of the analytical devices

In the beginning the equipment for new fuel laboratory of EERC had to be deployed. The ambition was to find an optimum between the given layout and infrastructure on one hand and the best position for a good workflow. In addition aspects of safety on workplace and a sufficient low pollution level had to be minded.

3.2.1.1 Floor plan of the laboratory inclusive sinks and exhausters

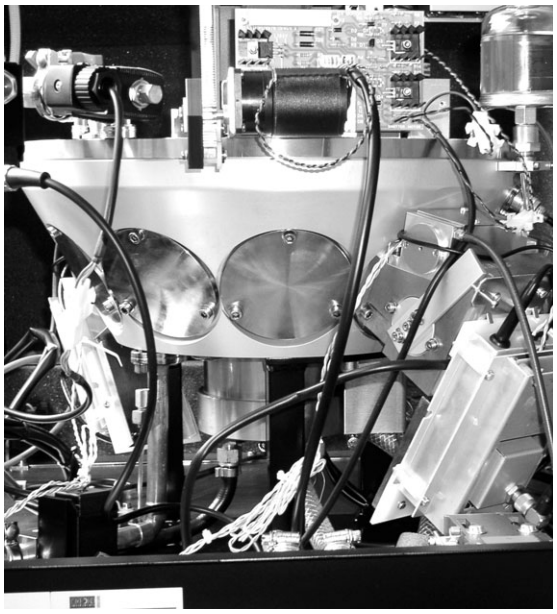


EERC fuel laboratory floor plan before deploying any devices

3.2.1.2 Single rooms and their devices

Room 2.1 will be used for distillation of gasoline and diesel samples and for the determination of the sulphur content. The sulphur content can be determined by a XRA device (EN 20 884) or by UV-fluorescence (EN 20 846).

XRA device



XRA, analyzer and monochromators

Additional UV-Vis device is in same room. All devices can and will produce a recognizable yet not critical amount of fuel vapour. Therefore a special exhausting system for the single devices is not necessary. The exhauster in the room can be used for sample preparation. The installation of all necessary supply with electricity, industrial gases and water in place.

Destillation devices

UV-Vis device

Room 2.2 is the room with all gaschromatographic devices (two GC-CST and one GC-PIONA). The devices will determine benzene (EN 12 177), the oxygenate compounds (EN 13 132) and the hydrocarbon distribution of gasoline (EN 14 517). The installation of all necessary supply with electricity, industrial gases and water in place. Because GCs are sensitive to high ambient temperatures, this room has to be air-conditioned in future if possible.

Gaschromatographic devices. Behind them on the wall there´s the supply with industrial gases

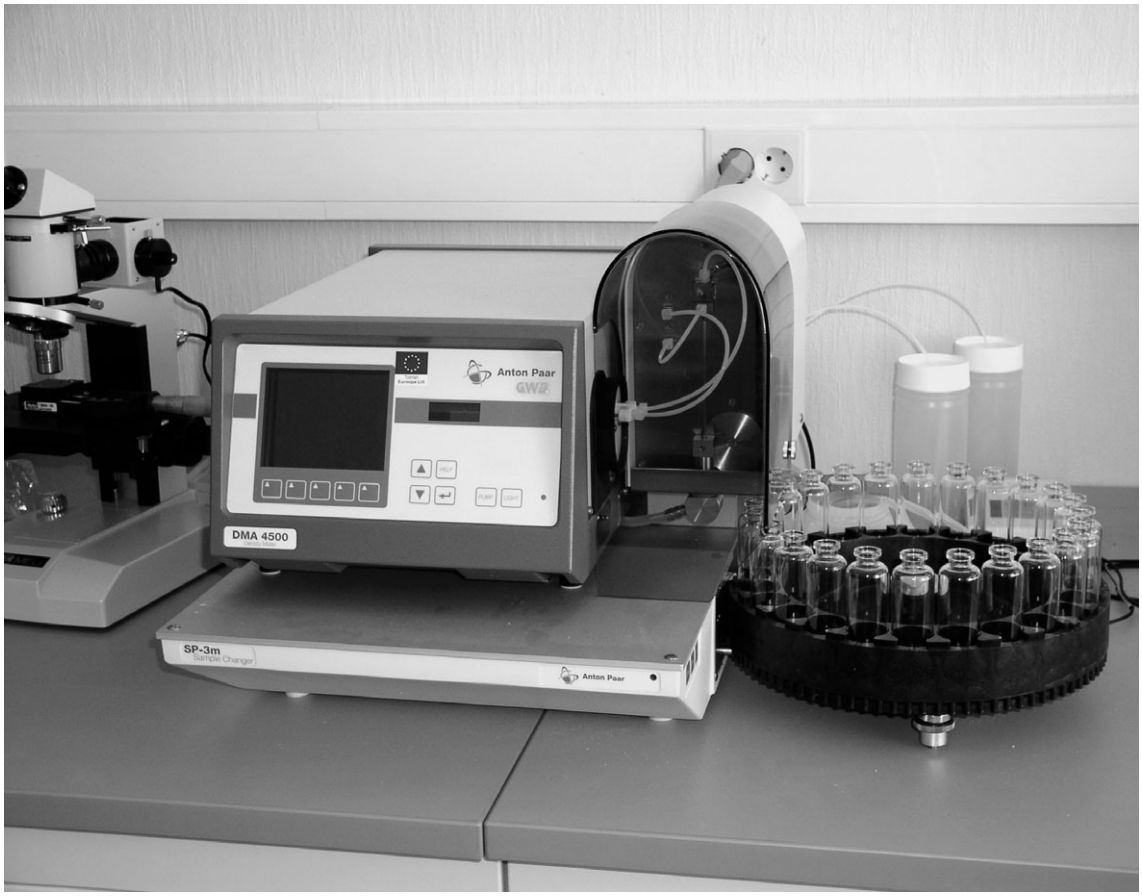
In addition there is the AAS device for the determination of the lead-content in gasoline (EN 237) in this room. As this AAS will run with organic samples only, this device will produce only a low amount of corrosive waste gases. Therefore this device can stay in this room and a spot exhauster is sufficient. But in the potential case, that in future inorganic solutions (normally aqua regia pulpings) should be analysed, this device has to move to another room. Then the waste gases of the AAS are highly corrosive and the amplifier-boards of the GCs with high-impedance resistors do not like this at all.

Room 2.3 already contains a small compressor for supplying the PIONA-GC with cooling air and the server for the local network. There is still the possibility of short current cut-offs, an UPS for the GCs will be installed. A good position for this device also is in room 2.3 at the wall close to the GCs. Compressor, server and UPS may produce waste heat. Ventilation may be recommended for the summer time.

Room 2.4 is similar to room 2.1. which is a room with low evaporating devices. Lubricity (EN ISO 12 156-1, HFRR-device with microscope), density (EN ISO 12 185), vapour pressure (EN 10 016-1) and water content (EN ISO 12 937) are on the one side of this room. The devices for cold behaviour (CFPP - cold filter plugging point - EN 116 and CP - cloud point – EN 23015) and viscosity (EN ISO 3104) are on the other side. The CFPP / CP devices are thermally conditioned by a cryostat. A special exhaustion for this room is not necessary. In case the cryostats produce too much heat in summer time air-condition may be useful.

HFRR device and microscope

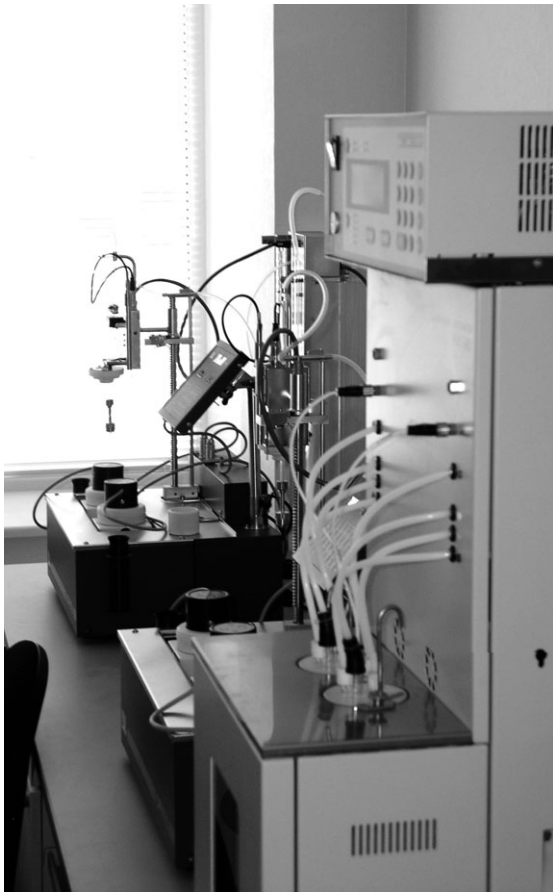
HFRR device



Density device

Vapour pressure device

Viscosity device



Viscosity and CP/CFPP devices

Room 2.5. contains quite silent devices. The HPLC (EN 12 916, PAHs in diesel fuel) and the IR-spectrometer (EN 14 078, FAME in diesel) produce almost no emission of odour nor noise. So here, on the other side of the room, desktops for paperwork can be deployed.

Room 2.6. will be the office of the head of the laboratory. No planning necessary.

HPLC and IR-Spectrometer devices

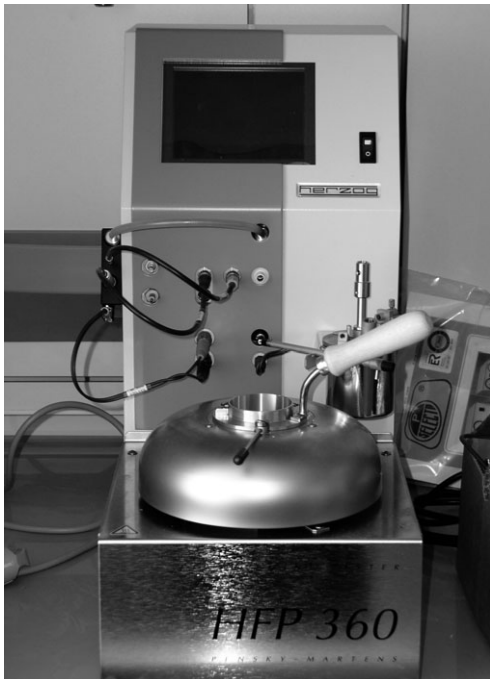
Room 2.7. In this room cleaning of laboratory devices will be carried out. In this room an industrial dish-washer is located and distilled water in different level of purity is produced. The industrial dish-washer must have a separate exhausting system. In case of cleaning bottles with a remaining of fuel the emission must be led outside.

Room 2.8 is the room with highly evaporating or sooty devices. Therefore special ventilation is compulsory. Concerning the pressure of evaporation a special description of this room follows. On the one side of the room there are exhausters with the devices for determining ash, flash point, micro carbon and evaporation residue. On the other side there are the test of copper corrosion, the drying oven and the muffle furnace and the test on oxidation stability. The analytical devices on this side will produce low evaporation, but some heat.

Exhausters with ash, flashpoint, micro carbon and evaporation residue devices

The devices in the exhausters in detail:

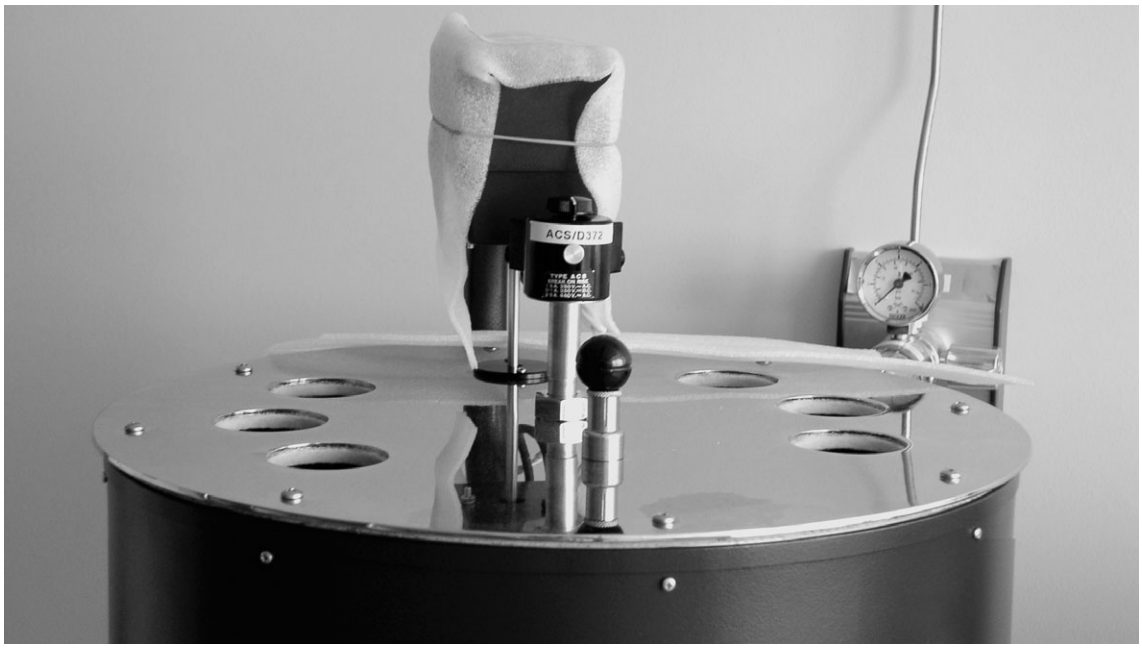
1. Micro Conradson Carbon (EN ISO 10 370) – carbon residue producing compounds in diesel can be detected. The principle is to heat a fuel sample up to 500 °C. Here most of the fuel has evaporated and some compounds have cracked (chemically disintegrated). The production of vapour is obvious. For operating this device an supply with nitrogen and an exhausting pipe is necessary.
2. Flash point (EN ISO 2719) – on diesel samples you check the temperature at which you can set fire to the diesel fuel. A security aspect (transport and storage) for this matter is necessary.



Flash point device

Micro carbon device

3. Evaporation residue (EN ISO 6246) – the name is self-instructional. Of each (gasoline) sample 50 ml are evaporated to look for a possible residue. This device produces a huge amount of gasoline steam. This steam is toxic, carcinogenic and extremely flammable. This device must be located in a exhausting chamber. The demand of air is high. The compressor must deliver a lot of volume but not a high pressure.
4. Ash content (EN ISO 6245) – a diesel fuel is burned. After extinguishing of the fire the remaining residue has to be annealed in a muffle furnace. Burning of the sample produces a lot of carbon black. One exhausting chamber was chosen to be used for the determination of ash. This chamber will become sooty very soon. Do not use any other exhausting chamber for this determination.



Oxidation stability for diesel

Oxidation stability for gasoline

3.2.2 Work flow diagram for fuel samples

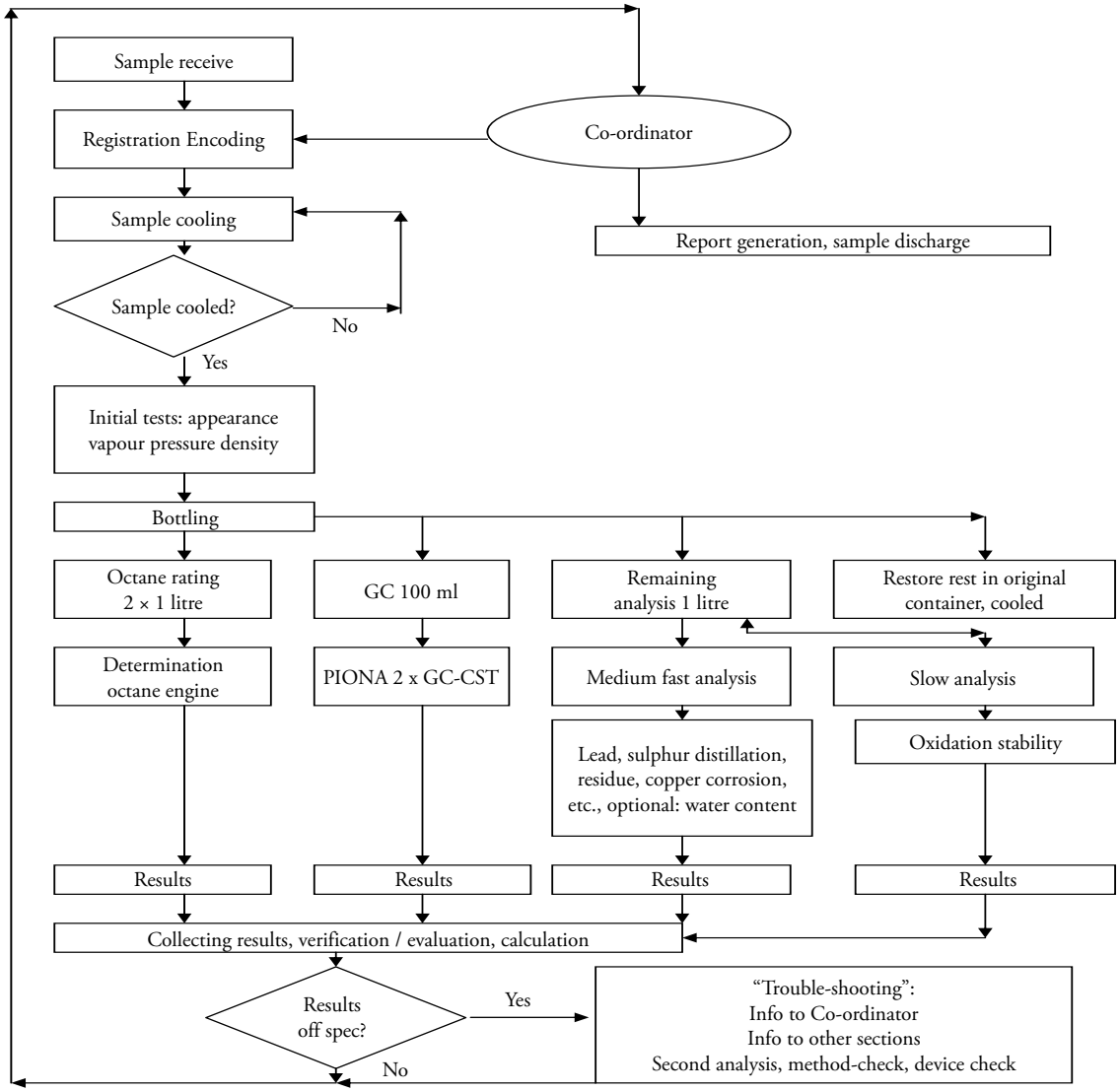
Important for a successful analytical examination of a fuel sample within a limited time is it's work flow.

Example:

On gasoline samples the first analysis always is the determination of the vapour pressure. This item has to be determined first because of a potential loss of highly volatile compounds in the fuel after opening the sample container. And if the sample has been prepared for this determination it is easy to follow up with the determination of the density and a sample split for the sections in the laboratory. This enables the sections to act simultaneously and deliver results within short times.

Below is presented a diagram of the work flow of a gasoline sample plus the comments to this diagram as it was shown and explained to the laboratory staff.

In case of diesel samples with the absence of highly volatile compounds the cooling of samples is not necessary. Here the emphasis of the work flow is on optimising the executing of sample batches. It is much more efficient to run a series of single analysis type with a batch of samples than analysing these samples one after the other.



Workflow for gasoline sample

Comments to the workflow:

1. Co-ordinator

At a volume of up to 500 samples per year one co-ordinator supervises the flow of the samples. The co-ordinator manages the sample receive, the registration and encoding.

During and after the analysis the co-ordinator collects the data, minds time limits, checks the results. The co-ordinator collects and evaluates the results, calculates e.g. the VLI (vapour lock index) and generates the analytical report. In case of off spec results he arranges measures.

After the analysis the co-ordinator discharges the sample from the analytical process.

2. In case of off spec values

In any case run a second analysis. Give information to the co-ordinator and to the other lab-sections so that they are prepared to unusual results and thus any damage on other devices can be avoided.

Example:

Off spec value:	end of distillation too high
Possible reason:	diesel fraction in gasoline
Effect on the results of:	octane number, evaporation residue, GC-results, etc.
Harmful to:	GC, device (GC-column) polluted

After a second analysis – which may confirm the off spec value – follows a method check and a device check: e.g. with calibration or intercalibration (round robin) samples.

3. Sample bottling

The determination of the octane numbers requires 1 to 2 litres of product. A second, small quota for the GC is recommended. The remaining analysis can be run out of the tin canister but it is recommended to bottle a quota of 1 litre for this analysis and store the rest under cool conditions. After the analysis and the delivery of the report the rest of the sample should be stored for at least 3 months. Please ask for the required storage time.

4. "Fast", "medium fast" and "slow" analysis

Example:

Lead and sulphur take up to 1 hour:	fast
Distillation, residue and copper corrosion, 1 to 3 hours:	medium fast
Oxidation stability take up to 18 hours:	slow

Fast and medium fast analysis should not run over night, if it is not necessary. In case of "slow" analysis this is inevitable but avoid running this particular analysis over the weekend. Mind safety procurements.

3.2.3 Training on analytical devices

A major part of activity C6 was the training of members of the EERC fuel laboratory with the new devices. Theoretical basement of the training were the SOPs and SOTs (see also 7.1 and 7.2 of first part).

Targets were:

- information about chemical and physical aspects of an analysis;
- information about the reason of an analysis;
- handling of the analytical device;
- knowledge about usual, unusual and off spec values;
- trouble shooting and maintenance;
- calibration and quality assurance.

3.2.3.1 Examples for this training

Example 1: Calibration samples for GC-CST, Benzene and Aromatics

EN 12 177 Determination of benzene content by GC and
DIN 51 413 – 9 Determination of total aromatics and benzene by CST

Ambition

- Calibrate EN 12 177 according to the specification limits of EN 228;
- Check out the method with a benzene concentration of 5 % (v/v);
- This was the specification limit in former times. At that time benzene concentrations of 2 to 4 % (v/v) were common. And even today region with low environmental standards still have such samples;
- Enhance the method according DIN 51 413 – 9;
- This method includes EN 12 177;
- Without any additional effort you can quantify the total aromatic content of a gasoline sample and verify the result of the PIONA GC, EN 14 517;
- Cover the whole specified range of concentration for benzene and for total aromatics.

Benzene content

- Create 5 calibration samples of benzene in a saturated HC (n-heptane, cyclohexane, iso-octane or a non-aromatic petrolether-blend) in the range of 0 to 1,8 % (m/m) which is equivalent to a benzene-content range of 0 to 1,4 % (v/v) and an additional sample of some 6 % (m/m), equivalent to 5 % (v/v);
- Example: 0 % (m/m), blank value, 0,3 % (m/m), 0,6 % (m/m), 1,0 % (m/m), 1,4 % (m/m), 1,8 % (m/m) and 6 % (m/m) benzene;
- Treat the calibration samples further on as a test samples (add 5 % MiBK as internal standard and run measurement);
- After creating the test samples please register and label them. Distribute and bottle in crimp cap vials, crimp carefully and store them under cool and dark conditions (refrigerator);
- Use certified material or/and check the purity by GC.

Total aromatic content

- Create a stock solution of
  3 units benzene
  30 units toluene
  30 units C8-aromatics (comment 1)
  25 units C9-aromatics (comment 2)
  15 units C10+-aromatics (comment 3)
  1 unit naphthalene (comment 4)
  0,5 units 1-methynaphthalene (comment 4);

- This composition complies roundabout with a typical aromatic distribution in gasoline. The specification limit in gasoline is 35 % (v/v) total aromatics, the typical range is 20 to 35 % (v/v). This is equivalent to an aromatic content of ≈ 24 up to ≈ 45 % (m/m);
- Create 5 calibration samples with a content of aromatic stock solution in the range of 15 to 55 % (m/m). (e.g.: 15, 25, 35, 45, 55 % (m/m) aromatics);
- Treat the calibration samples further on as a test samples (= add 5 % MiBK as internal standard and run measurement);
- After creating the test samples please register and label them. Distribute and bottle in crimp cap vials, crimp carefully and store them under cool and dark conditions (refrigerator);
- Use certified material or/and check the purity by GC.

Comments on the stock solution

- Comment 1: C8-aromatics, available are ethylbenzene, p-, m- and o-xylene and a C8-aromatic blend with a purity of 99,8 % (m/m);
- Comment 2: C9-aromatics, available are iso-propylbenzene (cumene), n-propylbenzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene and 1,2,3-trimethylbenzene.
  In a GC analysis iso-propylbenzene will be detected as the first of the C9-aromatics and 1,2,3-trimethylbenzene will be the last. So use at least these two compounds to identify the range of the C9-aromatics. Additionally there is available a C9-aromatic blend with a total-aromatics content of > 99 % (m/m) and C9-aromatics content of ≈ 90 % (m/m). It can be used in case you want to create an aromatic stock without a detailed composition table;
- Comment 3: C10+-aromatics, available are 1,2,3,5-tertamethylbenzene (iso-durene) and indane (normally a C9-aromatic with a naphthenic side-chain).
  Additionally there is available a C10+-aromatic blend with a total-aromatics content of ≈ 99 % (m/m) with a mixture of mostly C9- to C11-aromatics. It can be used in case you want to create an aromatic stock without a detailed composition table;
- Comment 4: naphthalene and 1-methylnaphthalene. These compounds normally are the highest boiling ones in gasoline. The GC-temperature program shall elute this components. Use these compounds to identify the end of the chromatogram.

Run measurements

- Run the samples, evaluate with “IS, internal standard” and “Area %”;
- Check and – if necessary – adjust the time-slots for the oxygenate-compounds;
- Determine response factors for benzene and the other aromatic compounds.

Bottling, storage and documentation

- Document the weighing list, bottle the whole mixture (e.g. if 15 ml mixture are produced then bottle 10 x 1,5 ml in vials);
- File the weighing list plus all results in the SOT;
- Crimp (carefully) and label the vials and the rest of the stock solutions and store them under cool and dark conditions (refrigerator). Run at least one calibration sample on every serial of test samples.

Creating more realistic test samples, further steps

- Mixture of aromatic- and oxy-blend. Mix some of this aromatics test sample with a defined quota of the oxy-blends to figure out the retention times of aromatic and oxygenate compounds. Here you can improve cutting and detection times;
- Adding benzene. Take a real gasoline sample (best with a low benzene content) and add defined amounts of benzene and test your rate of retrieval.

Example 2: Determination of the FAME-content in diesel fuel, EN 14 078
IR-spectroscopy method

The list of questions and procedures, which should be done with the IR-spectrometer during the stay of the contractor of Shimatzu is given below. Please ask this operator all the items which are necessary for a complete test. A complete test procedure (including a calibration series) shall be demonstrated.

The list of questions which have to be replied is the following:

- After turning the IR on how long shall the equilibration time be?
- Starting of the procedure, demonstration.
  Is the initialising procedure necessary before every measuring?
  When about adjustment? When is it necessary?
- Test of the device: polystyrene film, interpretation of the result, documentation of the spectra, comparison nominal to actual spectra. Is there a nominal polystyrene spectra in the library?
  This test should be made and documented at regular intervals to show the operability of the device. Storage in the SOT (technical manual).
- Problem with the polystyrene test. Why can´t we scan over the whole possible range of the device of 400 to 4000 cm^{-1}. The device itself made an restriction to 1200 to 4000 cm^{-1}. This lower area is not really necessary, just prying.
- Demonstration of a complete series of calibration and analysis of at least two test samples. What are the required settings for the FAME-Test, please optimise it. Our setting was: CO-bond-peak at 1740 cm^{-1}, scan from 1500 to 2000 cm^{-1}, 30 scans.
- Present problem: how can we overtake an already existing calibration for new samples and how can we store the results of a series of samples in one folder?
- Demonstration of the best way to document. STE preference: folders for every series of samples, name of the folder = date, writing in the American way(YY-MM-DD) e.g. tests made at 03.07.2006 into the folder 06-07-03.
- Please prepare the necessary solutions. Calibration samples from 0 to 10 g/l and diesel samples, diluted 1 to 10.
- As test sample you can take any sample which already has 5 % FAME or you blend a FAME-free diesel sample with defined volumes of pure FAME. With the second way you also can produce a “off spec”-sample with more than 5 % (v/v) FAME.
- What is the warning about: “CaF_2 splitter does not match selected MID range. Continue? Y/N”. Is there still a failure in the setup?
- Please show also the other technical options of the device.
- With this device you not only can quantify the amount of a known compound (e.g. FAME in diesel), you can also scan a sample with the intention to identify unknown compounds. How to make a qualifying scan of an unknown sample and how to compare this with library scans? Not necessary for this application, just prying.
- Trouble shooting. What are typical problems? What are typical errors? Where to keep an eye on?
- Maintenance. How often the drying agent has to be changed (round about estimated rates)?
- How is the procedure?
- Technical equipment which should be ordered in addition to the existing one: we have two materials for the use as window in the IR-cell – KBr and ZnSe. But we only have one rack to put those windows into. Please order a second rack so we do not have to open the cell every time if we want to change the material of the IR-cell. This rack should not be too expensive.

3.2.3.2 Conclusions

Due to the late start of the implementation of the laboratory the training missions overlapped with the implementation and were quite close to the end of the Twinning project.

Nevertheless the training has developed successfully. Members of the EERC fuel laboratory were becoming familiar with the type of sample which has to be analysed and the way of handling samples and results.

3.3 Activities C7 Training on multifunctional lab equipment: certification/classification of fuels and C9 Future training system

Future training, where to keep an eye on:

- In the end there should be "to-do"-lists for the analytical procedures. Where to keep an eye on and where to deepen exercising. These lists will resemble to the list shown in chapter 3.2.3.1 example 2;
- All the experience and all impressions which the members of the lab received during these first trainings should be noted. Future staff will have exactly the same problems and difficulties as the present members now have. So a report composed now will contain much more details for beginners than the report composed later. This report can be revised later and must be part of the relating SOT. This part of an SOT makes it become alive;
- In the middle of July 2006, about 50 test samples arrived in Tallinn (gasoline and diesel fuel of different qualities). All samples have already been analysed before, the results are given. With these samples the equipment can be tested "under real conditions" and the laboratory staff can be trained and can get a feeling for usual and unusual values. The sample amount is 2 to 2,5 litres per sample. It means that at least one complete analysis can be run of every sample. Analytical results of these samples are available. With these samples a training on real specimen can be carried out - without any pressure of time;
- After the accreditation, additional training will be necessary. The accreditation will clarify in which points exactly the training is required.

3.3.1 Training on engines (devices for analysing octane/cetane number)

Some provisional training plan was already mentioned in the first part of final report (see also 5.1 of first part). The training in June 2005 started with the inspection of implementation of the engines for testing fuels:

- gasoline according to Research Octane method (RON);
- gasoline according to Motor Octane method (MON);
- diesel according cetane engine method.

STE Peter Wilcken appreciated generally:

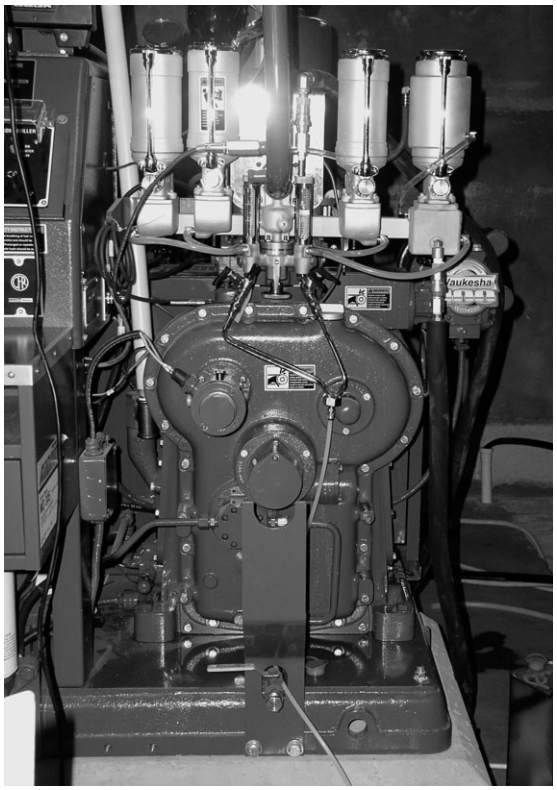
- excellent physical status of the engines;
- location of the engines not affected by certain disturbing gases and fumes;
- suitable foundation of engines and hook-up of all utilities;
- proper operation of test engines.

In the testing process of the device the engine components were inspected as required:

- Engine speed;
- Valve timing;
- Valve lift;
- Intake valve shroud;
- Direction of engine rotation;
- Carburetti venture;
- Valve clearances
- Oil pressure;
- Oil temperature;
- Cylinder jacket coolant temperature;
- Intake air temperature;
- Cylinder jacket coolant level;
- Crankcase internal pressure;
- Exhaust back pressure;
- Exhaust and crankcase breather system resonance;
- Belt tension;
- Rocker arm carrier support basic and basic setting;
- Rocker arm and push rod basic setting;
- Basic spark setting;
- Basic ignition timer transducer to rotor vane gap setting;
- Basic ignition timer control arm setting;
- Spark-plug gap;
- Basic cylinder height setting.

Similarly to the CFR engine the setting of the diesel engine was inspected, especially injection settings and basic setting of variable compression plug.

Octane engine



Octane engine fuel supply

The difference between the RON and MON engine is to simulate two driving conditions e.g. on the motorway:

1. condition: car is driven with light load;
2. condition: car is driven with heavy load (4 person with luggage).

These conditions expressed in technical terms:

1. Engine Speed
RON: 600 plus/minus 6 rpm (run per minute)
MON: 900 plus/minus 9 rpm

2. Intake air temperature
RON 125 plus/minus 2 ° F by 101,0 kPa, variable
MON 100 plus minus 2 ° F, constant

3. Mixture temperature
RON not in use
MON 300 plus/ minus 2 ° F, constant

4. Basic spark setting
RON 13 ° btdc
MON 15 – 25 ° btdc, regarding cylinder height

Octane engine fuel supply

After inspection of engines settings the operating conditions were controlled to be at equilibrium and in compliance with basic engine and instrument specifications.

Engine fit-for-use qualification

The requirements for the fit-for-use test is to rating a toluene standardization fuel (TSF) blend for every RON range in which sample fuels are to be rated in accordance with:

- at least once during a 12 h operating period;
- after an engine has been shut down for more than 2 h;
- after an engine has been allowed to operate at non –knocking conditions for more than 2 h;
- after a change in barometric pressure of more than 0,68 kPa (0,2 in Hg) from that which prevailed at the time of the previous TSF blend rating for a RON range to be used for rating sample fuels.

The bracketing procedure for rating TSF blends was carried out using the cylinder height (compensated for barometric pressure) in accordance with the guide table for standard knock intensity for the RON accepted reference value of the TSF blend. The standard knock intensity was determined using the PRF blend which whole RON is closest to the RON accepted reference value of the TSF blend.

Using the standard intake air temperature based on the prevailing barometric pressure the RON of an untuned TSF blend was determined. The engine was qualified as fit-for-use because this TSF blend rating is within the untuned rating tolerance of plus/minus 0,3.

This conclusion is derived from the test results of three motor runs:

- runs untuned rating tolerance: 0.1;
- runs untuned rating tolerance: 0,0;
- runs untuned rating tolerance: 0,2.

This inspection procedure was done for all three engines in compliance with the relevant EN standards:

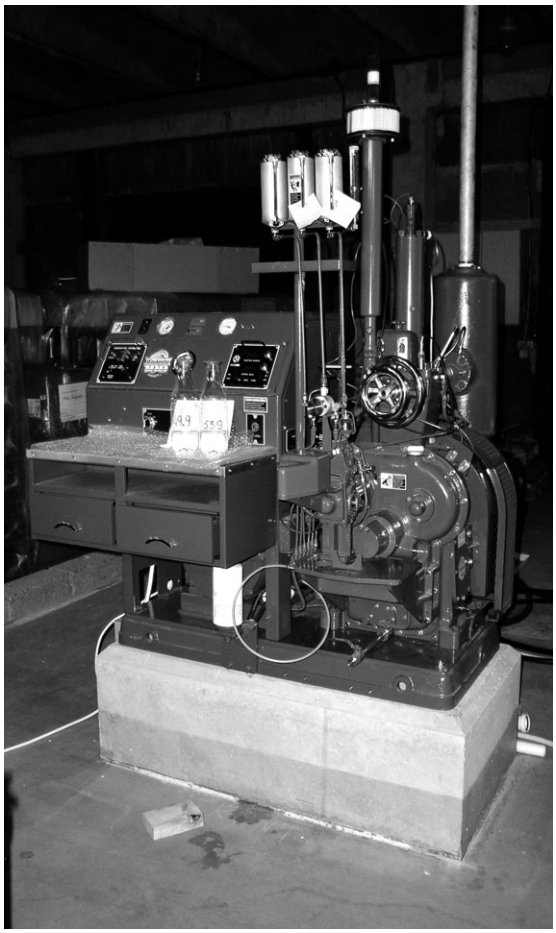
- RON: EN ISO 5164;
- MON: EN ISO 5163;
- cetane number: EN ISO 5165.

Checking performance on check fuels

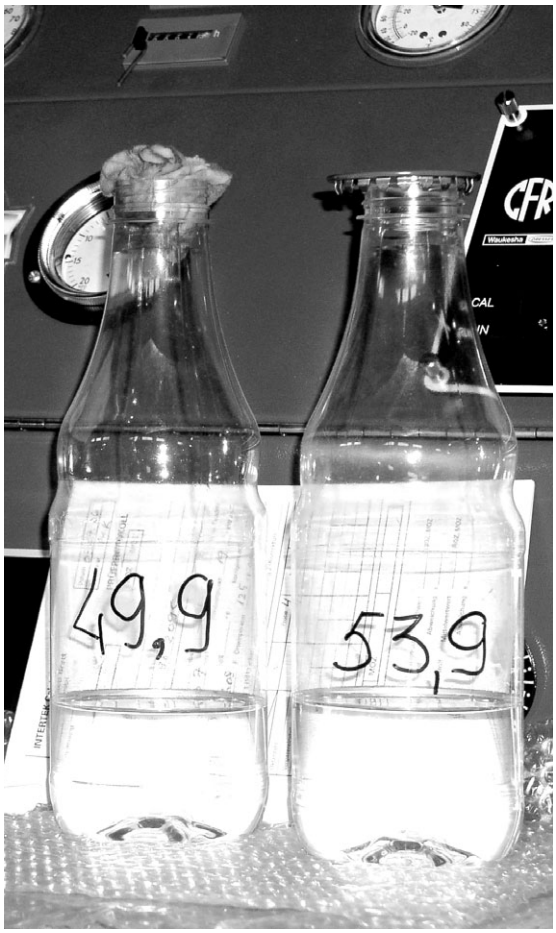
After the demonstration of inspection of engines procedures the determination procedure of RON, MON and cetane number started and took in total three weeks. The calibration of the fuel starts with filling Toluene Standard Fuel (TSF) blend into one cylinder and the fuel sample in the next cylinder. To determine RON the Bracketing – equilibrium fuel level method is applied. The engine and instrumentation was calibrated to establish standard knock intensity using TSF which RON is close to that of the sample fuels to be tested. Then the detonation meter control was adjusted to produce a knockmeter reading of 50 divisions.

Next step was to adjust the air fuel ratio and determine the maximum knockmeter reading attainable at 50 divisions but not higher than 60. Then a primary reference fuel no 1 of iso-octane (e.g. 94 octane) and primary reference no 2 of n-heptan (e.g. 96) were mixed expecting to have a RON close to that of the sample fuel.

The digital counter readings were compared with the Guide Table for Standard Knock Intensity and the respective RON could be read.



Cetane engine



Cetane engine, calibration fuel

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TABLE A6.1 *Continued*

Research Octane Number	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	Digital Counter Readings									
99	893	895	898	900	903	906	909	912	915	917
100	919	924	925	928	932	936	939	940	944	949
101	950	953	957	960	964	967	969	973	976	980
102	983	986	987	990	994	997	1000	1003	1005	1008
103	1011	1014	1017	1019	1022	1025	1028	1031	1034	1036
104	1039	1042	1043	1045	1048	1050	1052	1055	1057	1059
105	1062	1063	1065	1067	1070	1073	1074	1076	1079	1080
106	1081	1084	1086	1087	1090	1091	1093	1094	1097	1098
107	1100	1101	1103	1104	1105	1107	1110	1111	1112	1114
108	1115	1117	1118	1120	1121	1122	1124	1125	1127	1128
109	1131	1132	1134	1135	1136	1138	1139	1141	1142	1142
110	1145	1146	1148	1148	1149	1151	1152	1153	1155	1156
111	1158	1159	1160	1162	1163	1165	1166	1167	1167	1169
112	1170	1172	1173	1175	1176	1177	1179	1180	1182	1183
113	1184	1186	1186	1187	1189	1189	1191	1193	1194	1196
114	1197	1197	1199	1200	1201	1203	1204	1206	1207	1208
115	1208	1210	1211	1213	1214	1215	1218	1220	1221	1222
116	1224	1225	1227	1228	1230	1232	1234	1235	1237	1238
117	1239	1241	1242	1244	1245	1246	1249	1251	1252	1253
118	1255	1256	1258	1259	1260	1262	1265	1266	1268	1269
119	1270	1272	1273	1275	1276	1277	1280	1282	1283	1285
120	1286	1287	1289	1290	...	...	...	...	...	...

[A] Equivalent dial indicator reading = $1.012 - \frac{\text{digital counter reading}}{1410}$

Guide Table for Standard Knock Intensity

TABLE A6.1 Guide Table for Standard Knock Intensity at Standard Barometric Pressure[A]—9/16 in. Venturi Digital Counter Readings for Research Octane Numbers

NOTE—See Tables A6.4 and A6.5 for digital counter reading compensation for barometric pressures other than 101.0 kPa (29.92 in. Hg).

Research Octane Number	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	Digital Counter Readings									
40	357	357	357	357	358	359	359	359	360	360
41	361	361	361	362	362	363	363	363	364	364
42	364	365	365	366	366	366	367	367	368	368
43	368	369	369	370	370	370	371	371	372	372
44	373	373	373	374	374	375	375	375	376	376
45	377	377	378	378	379	379	380	380	381	382
46	382	383	383	384	384	385	385	386	386	387
47	387	388	388	389	389	389	390	390	390	390
48	391	391	392	392	393	393	394	395	395	396
49	396	397	397	398	399	399	400	400	401	402
50	402	403	403	404	404	405	405	406	406	406
51	407	408	408	409	410	410	411	411	412	412
52	412	413	413	414	414	415	415	416	417	417
53	418	418	419	419	420	420	421	422	422	423
54	423	424	424	425	426	426	427	427	428	428
55	429	429	430	430	431	432	432	433	433	434
56	435	435	436	436	437	437	438	439	439	440
57	440	441	441	442	442	443	443	444	444	445
58	446	446	447	448	448	449	449	450	450	451
59	451	452	453	453	454	454	455	455	456	457
60	457	458	458	459	460	460	461	461	462	462
61	463	464	465	465	466	467	467	468	469	470
62	470	471	471	472	472	473	474	474	475	475
63	476	477	478	478	478	479	479	480	481	481
64	482	483	484	484	485	485	486	486	487	488
65	488	489	490	491	491	492	492	493	494	495
66	495	496	497	498	498	499	500	501	501	502
67	502	503	503	504	505	506	507	508	508	509
68	509	510	510	511	512	513	513	514	515	515
69	516	517	517	518	519	519	520	520	521	522
70	523	524	525	525	526	526	527	527	528	529
71	530	531	532	532	533	533	534	534	535	536
72	537	538	539	539	540	540	541	542	543	544
73	545	546	546	547	548	548	549	550	551	552
74	553	554	554	555	556	557	558	559	560	560
75	561	562	563	564	565	566	567	567	568	569
76	570	571	572	573	574	575	576	577	578	579
77	580	581	581	582	583	584	585	586	587	588
78	589	590	591	592	593	594	595	596	597	598
79	599	600	601	602	603	604	605	606	607	608
80	609	610	611	612	613	614	615	616	617	618
81	619	620	621	622	623	624	625	626	627	628
82	629	630	631	632	633	634	635	636	637	639
83	640	641	642	643	644	645	646	647	648	649
84	650	651	652	653	654	656	657	658	659	660
85	661	663	664	666	667	668	669	670	671	672
86	673	674	675	677	678	680	681	682	683	684
87	685	687	688	689	691	692	694	695	697	698
88	699	700	701	702	704	705	706	708	709	711
89	712	713	715	716	718	719	721	722	723	725
90	726	728	729	730	732	733	735	736	737	739
91	740	742	743	744	746	747	749	750	752	753
92	756	757	759	760	761	763	764	766	767	768
93	770	772	774	776	778	780	781	783	784	785
94	787	789	791	793	795	797	799	801	802	804
95	805	807	809	811	812	814	816	818	820	822
96	824	826	828	830	832	835	837	839	841	843
97	845	847	849	852	854	856	858	860	862	864
98	867	870	873	875	877	880	883	885	888	891

Guide Table for Standard Knock Intensity

Two additional series of readings were added by operating the engine twice. The average RON based on two series of knocking readings constitutes a rating of the difference in the calculated RON values for each of the individual series of knockmeter readings is not greater than 0,3 RON.

The calculation of octane number

The obtained readings of ref. materials and the sample are put on a special graphical analysis.

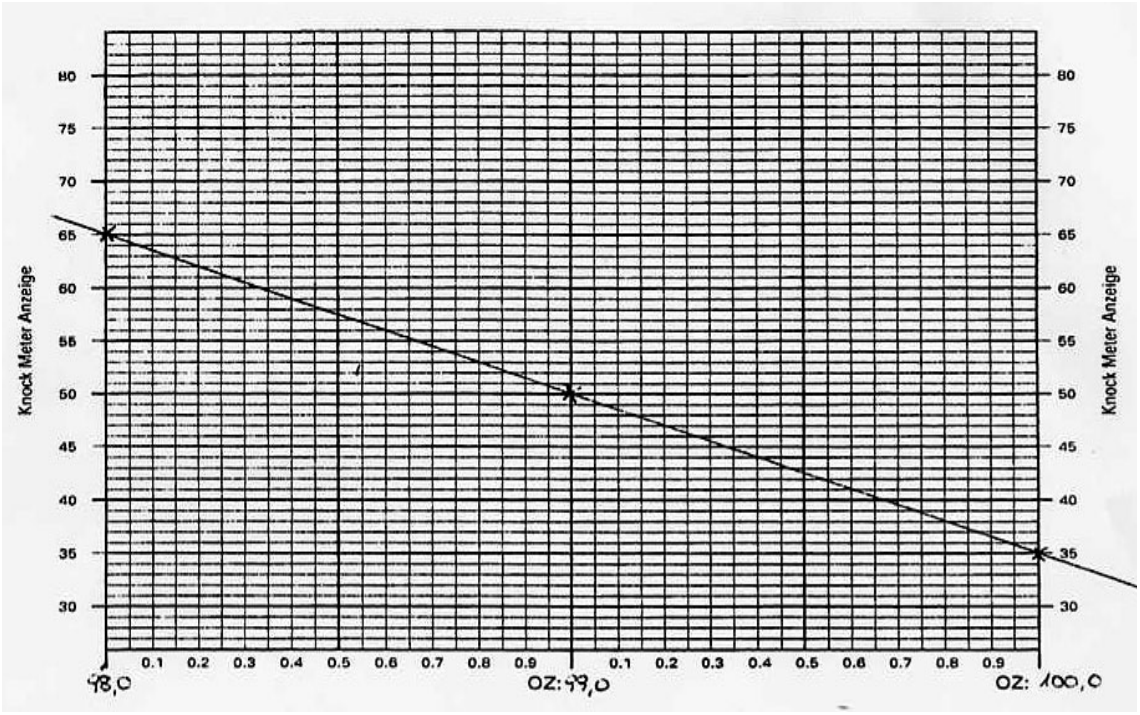


Diagram for the calculation of octane rating

The example given is based on high octane ref. mat. of 100 octane and a knockmeter reading of 35 divisions and a lower octane ref. mat of 98 octane equivalent to 65 knockmeter readings. The sample fuel reading was 50. According to the metrical system of the graphic the RON of the sample fuel is 99,0.

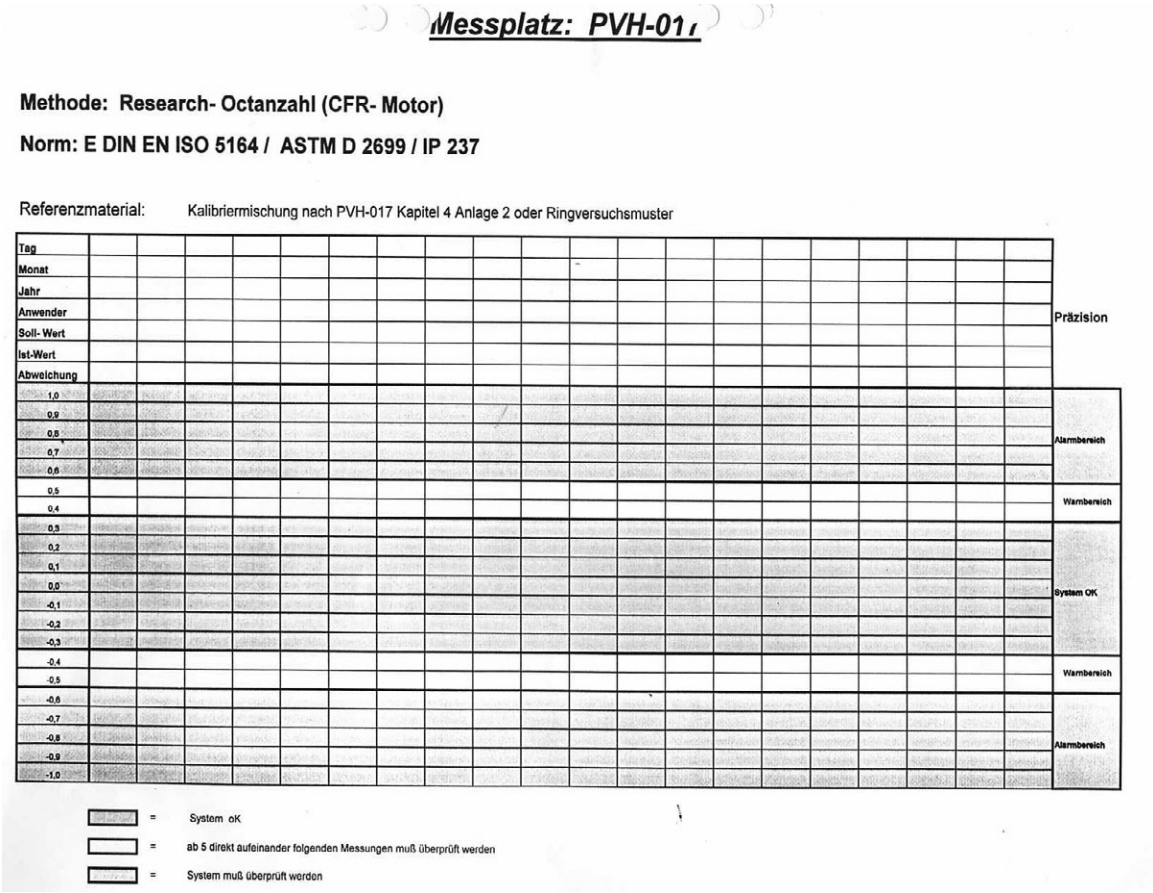
An appreciated transparency of RON measurements represents an overview table on series of measurements and deviations.

This table is very appreciated by monitoring procedure for accreditation.

After getting the test results test report was completed. According to the relevant standard the test report should contain:

- reference to the standard;
- type and complete identification of the product tested;
- results of the test;
- any deviation, by agreement or otherwise, from the procedures specified;
- the date of the test;
- signature.

Next after RON test procedure was MON test procedure which is very close to RON test but taking care of the differences as indicated above.



Range control chart of the octane

The calculation of cetane number

The test procedure applied at the cetane engine reflects some differences:

- First again the engine operating conditions were checked to comply and to equilibrate with the engine running on a typical diesel fuel;
- The test procedure started with the check of the fuel flow rate to obtain 13 ml/min consumption;
- After establishing the fuel flow-rate the injection-timing-micrometer of the fuel pump assembly was adjusted to obtain 13,0 injection advance reading;
- Afterwards the handwheel to change the compression ratio and obtain a 13,0 ignition delay reading was adjusted;
- Then the handwheel reading was observed and recorded as the representative indication of the combustion characteristics for this fuel sample. This reading is comparable to the knock counter reading for RON;
- Two referential materials were selected, one T fuel with cetane number of 19,4 and the second U fuel with 76,0 cetane number;
- The test were repeated twice and the calculation of the cetane number followed the graphic method. The repeatability of the test procedure was also trained according to the standard.

The test reporting scheme is identical with the scheme used for RON and MON.

The trainee practised all testing procedures several times. He demonstrated autonomous testing of the fuels in compliance with the standard and is therefore skilled to determine octane and cetane numbers according the methods set by European standards EN 228 and EN 590.

4 Component D. Information Technology

4.1 Activity D3. Electronic data provision and reporting schemes

Additional activities which support fuel data system in the frame of activity D3 are based on activities B4 Further activities in the area of compliance, B5 Co-operation with the oil industry in Estonia and B6 Transparency of fuel product quality.

The first part of the final report (see also 6.3.1 of first part) covered the data requirements and the interfaces among the institutions to manage the Estonian fuel quality monitoring. Although this process is continuing all institutions agreed on the target to implement a national database for fuel quality monitoring. This database should satisfy the requirements of all institutions concerned and the public access to non –individual data. The database is to be implemented at the Environmental Information Centre with support of EERC.

Content of the database

The database has to contain the required information on fuel monitoring in different sectors. These sectors are:

- automotive fuels according to FQMS;
- heating oil fuels;
- biofuels;
- ship/marine fuels.

The information on automotive fuel monitoring will cover all filling stations operating in Estonia. The results of annual fuel quality monitoring will be stored. The details of results on compliance with the parameter of the Directive 98/70/EC can also be observed.

The plan on future fuel quality monitoring with regard to filling stations will be covered. The reports on national fuel quality monitoring to European Commission will also be in the data base. This report covers also the annual consumption of automotive fuels – petrol and diesel. The total consumption of petrol will be allocated to the different grades of 92, 95 and 98. These grades will be subdivided according to their containing of 50 ppm or 10 ppm sulphur.

Last market information concerns the amount of biofuels used.

Heating oil are split into two oil products: light and heavy heating oil. The monitoring of heating oil will focus on the sulphur content and the annual consumption figures.

Control of ship/marine fuels will concentrate on the sulphur content of the fuels used.

Providers of required data

The main provider of data input to the data base will be EERC. The information will reflect the test results of the fuel quality with regard to fuel monitoring; it will also reflect the results of fuel quality management of FQMS.

Users of database

The main users of the database will be government institutions which need the information to

perform their relevant tasks. Others users will come from the general public; their access to the data will be restricted to non-individual data.

Lines of communication

The contractor of the IT system will take care that the platform of the data base will be in conformity with the requirements of the users. Since this task is in development there will be enough time to meet all requirements.

Administrator of data base

The Environmental Information Centre will administrate the database. The homepage will indicate the content of information and the procedure to access them. This process is ongoing.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