

# INFINEUM WORLDWIDE WINTER DIESEL FUEL QUALITY SURVEY 2002

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# INTRODUCTION

*The Infineum Worldwide Winter Diesel Fuel Quality Survey aims to provide the petroleum refining and distribution industry with an overview of the quality of diesel in the marketplace, allowing international trends to be followed. To achieve its purpose, the Survey needs to cover as much of the globe as possible. For the Winter 2002 survey, some 259 samples were collected in 33 countries around the world. The majority of samples were collected during January and February, deep winter months in the northern hemisphere. In southern hemisphere countries, sampling was delayed until later in the year when true winter grade samples could be obtained.*

*Samples need to be representative of the diesel purchased by the average consumer, so they are purchased from service stations by Infineum colleagues at local area offices. As a general principle, Infineum tries to get one sample that represents the production from each refinery or region in a given country. To minimise the possibility of taking multiple samples from a single refinery, knowledge of local exchanges agreements and the distribution system is used to select where each sample is collected. For the larger diesel consuming countries, this procedure results in samples that represent a reasonable average of the overall quality. However, for smaller countries or specific producers, spot sampling over a short period of time will effectively only provide a snapshot of production quality, with data derived from only one or two samples. This can make it more difficult to evaluate trends with any accuracy.*



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# THE TRENDS

*Historically, it has been difficult to offer anything other than general observations when diesel survey data have been analysed with a global perspective. Trends have tended to be confined to specific market segments or geographical regions and have usually been lost in the wider picture. In recent years however, there has been a change. Widespread environmental concerns around the globe have aligned thinking on a scale that would not have been considered possible only a few years ago. The main axis of alignment has been sulphur reduction and it is within this context that we are now able to see what can be described as a truly worldwide trend.*

## **Sulphur Content**

*Many publications have already addressed both current and future sulphur levels for the major diesel fuel market regions so these will not be dealt with in detail here. In summary these involve a reduction from the current limit of 350mg/kg to 50mg/kg by 1st January 2005 within Europe, and a reduction from the current limit of 500mg/kg to 15mg/kg by 1st June 2006 in the US and Canada.*

*Numerous sulphur reductions are also planned in countries outside of the large regions already mentioned. For example, Japan introduced 50mg/kg sulphur diesel in metropolitan areas during October 2002 and will expand this nation-wide before midyear 2003.*

*The specification reductions may appear to be substantial and the time scales short, but in a number of countries they also belie reality. Tax incentives have been applied by a number of European governments that are driving sulphur content reduction ahead of legislation. It is currently the case that; Belgium, Denmark, Finland, Netherlands, Norway, Poland and the UK produce diesel with less than 50mg/kg of sulphur. These are impressive reductions by any standard, but are overshadowed by Sweden, where sulphur levels are already below 10mg/kg, by Germany, where sulphur will be below 10mg/kg by 1st January 2003, and by Italy, where 10mg/kg sulphur diesel became an optional grade during November 2002.*



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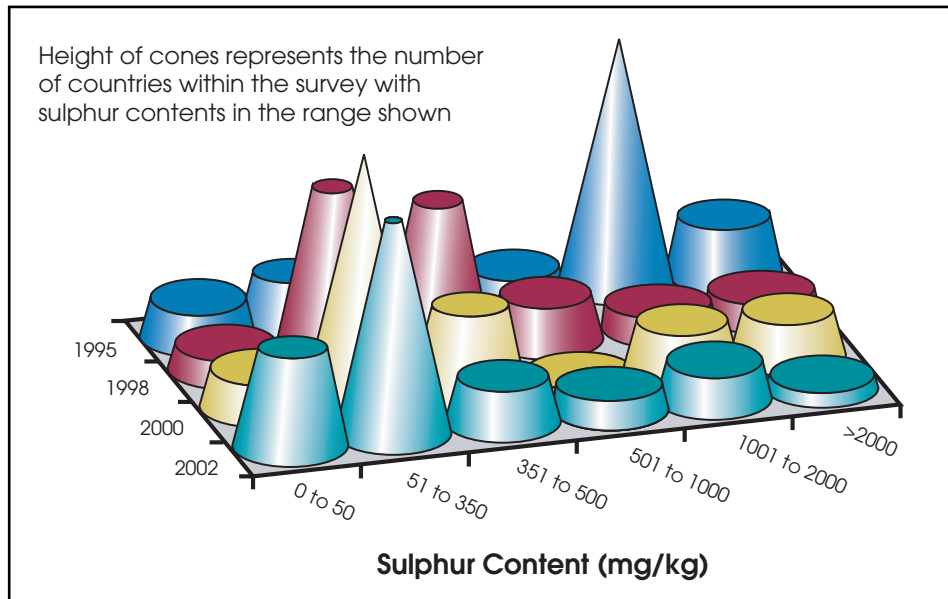
# THE TRENDS

The sulphur reductions driven by tax incentives are clearly visible in the trend depiction shown here, but these are only one part of a much wider picture.

The survey data show that in 1995 the majority of countries surveyed produced diesels with sulphur contents of between 1000mg/kg and 2000mg/kg. By 1998, the peak had moved to between 50mg/kg and 500mg/kg, and the latest survey shows another step forward - with the majority of production now occurring at between 0mg/kg and 350mg/kg.

## Lubricity

It is now widely accepted that increased desulphurisation has an adverse effect on the lubricating qualities of diesel. This has resulted in the widespread use of lubricity additives and the adoption of lubricity test methods and specifications for quality control. The test method most commonly accepted today is the High Frequency Reciprocating Rig or HFRR. Most specifications that include lubricity performance require that HFRR wear scars are limited to a maximum of 460µm, though it is worth noting that the Worldwide Fuel Charter currently recommends a maximum of 400µm.

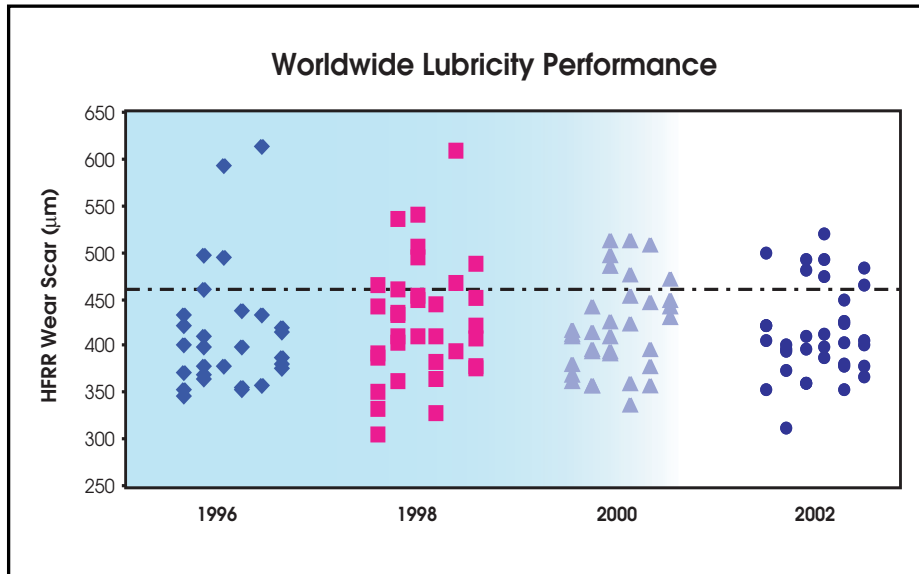


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# THE TRENDS

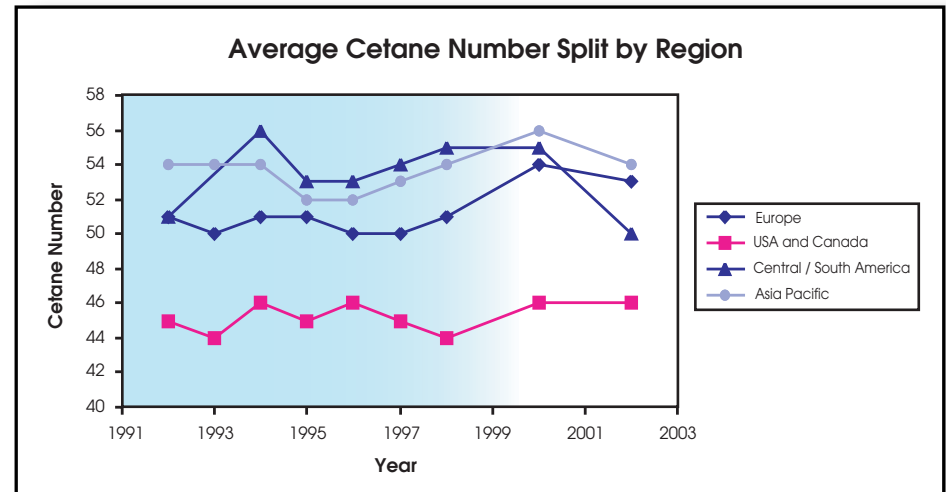
HFRR data generated during the diesel surveys conducted since 1996 show that lubricity standards have been maintained despite the dramatic sulphur reductions that have been recorded for the same period.



## Cetane Number

The latest edition of the Worldwide Fuel Charter continues to advocate high diesel cetane number as a means of reducing vehicle exhaust emissions. For use in regions where advanced emission control requirements exist, fuels are recommended to have cetane numbers of 55 or above. Less stringent levels are recommended for markets with lower level emission control requirements, but the absolute minimum for use in the most basic market is still recommended to be 48.

Diesel survey data collected over the past 10 years do show a trend towards increasing cetane number in most regions, though even today the majority of diesel fuels produced fall short of the Worldwide Fuel Charter recommendations.



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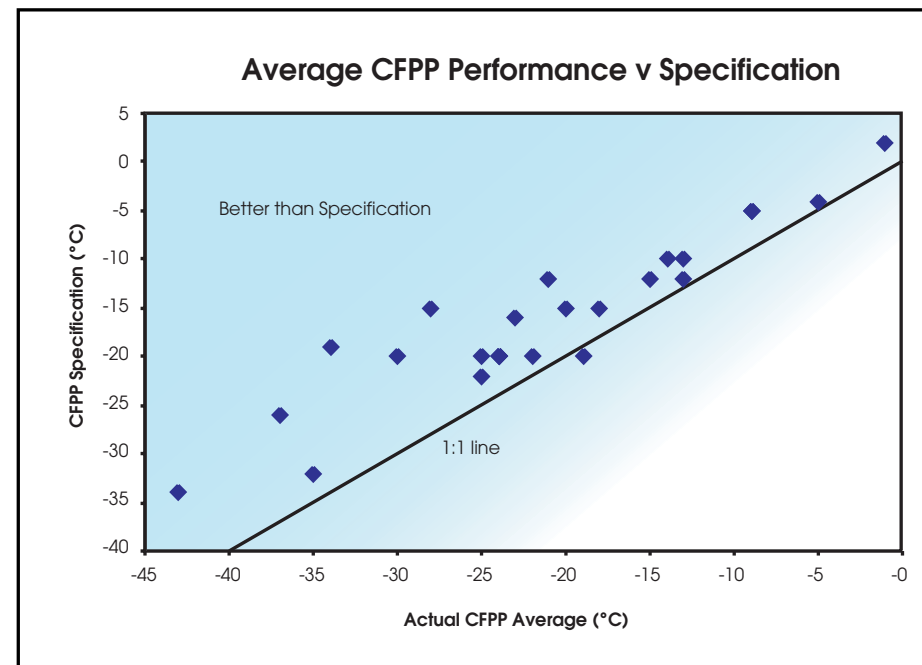
# THE TRENDS

Asia Pacific countries remain at the top of the cetane ladder, while the different approach to cetane in the US and Canada retains this, largely heavy duty market, at the bottom. It should be noted however, that US West Coast diesels do have higher cetane values than indicated by this chart as these fuels need to meet California Air Resources Board cetane requirements. A specification change within Europe in 2000 has now increased cetane numbers in this region to something approaching the levels of those in Asia Pacific. Cetane levels in Central/South America appear somewhat erratic in this analysis, but this is probably more a function of variation of the countries included in the surveys.

## Cold Flow

Cold flow specifications were set in most countries many years ago and have not changed significantly over the past 10 years. It is, therefore, not surprising that trends in cold flow performance are not detected within the survey data. However, this is an important area for refiners and should not be forgotten. In most areas, cold flow performance is now established by test methods designed to protect the most severe vehicles in the field. Cold Filter Plugging Point, or CFPP, is the most widely used of these test methods and has been used to evaluate samples collected during this survey.

This chart compares average measured CFPP values versus specifications for all surveyed countries that use CFPP as the primary cold flow specification. The chart clearly demonstrates that the majority of diesel fuels tested during 2002 either met or exceeded the cold flow specifications imposed.



# WORLDWIDE SUMMARY



Contents





# WORLDWIDE DIESEL FUEL SURVEY - 1

## Physical inspection data

## Mean values

Country	Argentina	Australia	Austria	Benelux	Brazil	Canada	China S
Number of samples	13	8	5	8	3	9	0
Density (kg/m <sup>3</sup> @ 15°C)	849.6	847.0	832.8	834.7	850.4	846.7	-
KV (cSt at 40°C)	3.41	2.97	2.47	2.56	2.99	2.47	-
KV (cSt at 30°C)	-	-	-	-	-	-	-
KV (cSt at 20°C)	5.72	4.65	3.77	3.96	4.76	4.13	4.64
Cloud Point (°C)	1	-3	-9	-8	7	-25	-
Pour Point (°C)	-15	-7	-29	-28	-16	-35	-4**
CFPP (°C)	-10	-4	-25	-20	-1	-27	-2
LIFT (°C)	-	-	-	-	-	-26	-
D86 Distillation							
IBP	165	188	172	166	135	169	-
10%	218	229	203	206	186	193	-
20%	237	242	218	219	209	208	-
50%	283	271	259	264	272	253	269
95% (90%)*	352*	338	343	344	397	319*	339*
FBP	378	352	355	355	401	347	-
Sulphur (mg/kg)	1107	622	249	35	1583	288	1200
HFRR (µm)	387	400	373	411	354	484	-
Wax content (wt%) at 10°C Below Cloud	2.0	4.9	1.8	1.5	1.1	1.2	-
Calculated Cetane Index <small>4Variable</small>	49.6	49.8	51.1	51.6	46.0	43.9	-
Cetane number	51.0	52.8	54.2	52.7	45.7	43.6	48.0

\*\* Solid Point



Contents



# WORLDWIDE DIESEL FUEL SURVEY - 2

## Physical inspection data

## Mean values

Country	China N	China NE	China NW	Czech	Denmark	Finland	France
Number of samples	0	0	0	3	2	5	12
Density (kg/m <sup>3</sup> @ 15°C)	-	-	-	836.7	843.8	824.5	834.5
KV (cSt at 40°C)	-	-	-	2.57	2.57	1.99	2.38
KV (cSt at 30°C)	-	-	-	-	-	-	-
KV (cSt at 20°C)	4.10	2.21	4.60	3.96	3.96	2.92	3.61
Cloud Point (°C)	-	-	-	-10	-13	-28	-6
Pour Point (°C)	-12**	-39**	-21**	-34	-41	-43	-29
CFPP (°C)	-7	-34	-15	-24	-30	-43	-20
LTFT (°C)	-	-	-	-	-	-	-
D86 Distillation							
IBP	-	-	-	174	158	176	161
10%	-	-	-	209	203	203	195
20%	-	-	267	217	218	210	210
50%	268	214	329*	260	263	235	259
95% (90%)*	309*	260*	-	341	350	308	351
FBP	-	-	-	353	358	322	359
Sulphur (mg/kg)	1000	200	1000	229	48	23	276
HFRR (µm)	-	-	-	425	405	422	311
Wax content (wt%) at 10°C Below Cloud	-	-	-	1.6	1.0	0.9	1.7
Calculated Cetane Index <small>4Variable</small>	-	-	-	50.2	47.8	49.0	50.1
Cetane number	51.0	48.0	51.0	51.1	51.9	52.6	51.5

\*\* Solid Point



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# WORLDWIDE DIESEL FUEL SURVEY -3

## Physical inspection data

## Mean values

Country	Germany	Greece	Hungary	Italy	Ireland	Japan G2	Japan G3
Number of samples	19	3	1	15	7	23	1
Density (kg/m <sup>3</sup> @ 15°C)	830.4	836.8	838.0	835.2	836.0	836.2	837.0
KV (cSt at 40°C)	2.48	3.28	4.17	2.66	2.68	3.93	3.16
KV (cSt at 30°C)	-	-	-	-	-		
KV (cSt at 20°C)	3.78	5.32	2.69	4.19	4.17		
Cloud Point (°C)	-8	1	-8	-2	-11	-3	-14
Pour Point (°C)	-28	-13	-24	-20	-26	-21	-28
CFPP (°C)	-25	-9	-24	-13	-21	-9	-15
LTFT (°C)	-	-	-	-	-	-	-
D86 Distillation							
IBP	175	189	181	170	183	168	171
10%	206	232	214	204	216	215	206
20%	218	249	226	221	230	237	226
50%	258	284	266	268	265	286	271
95% (90%)*	345	355	351	356	339	339*	320*
FBP	357	366	364	370	353	366	350
Sulphur (mg/kg)	33	301	210	265	62	353	460
HFRR (µm)	397	473	424	406	379	401	482
Wax content (wt%) at 10°C Below Cloud	1.5	2.7	1.4	1.9	1.6	2.5	1.9
Calculated Cetane Index <small>4Variable</small>	52.2	56.8	51.3	52.0	52.0	55.8	51.6
Cetane number	55.1	56.0	54.8	51.9	53.9	55.0	49.1



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# WORLDWIDE DIESEL FUEL SURVEY - 4

## Physical inspection data

## Mean values

Country	Japan SG3	Korea	Malaysia	Mexico	Norway	Poland	Portugal
Number of samples	2	5	5	6	4	2	3
Density (kg/m <sup>3</sup> @ 15°C)	812.0	831.6	834.4	834.3	830.0	833.1	839.2
KV (cSt at 40°C)		2.70	3.51	2.78	2.07	2.97	2.85
KV (cSt at 30°C)	2.15	-	-	-	-	-	-
KV (cSt at 20°C)		4.12	5.74	4.36	3.07	4.70	4.48
Cloud Point (°C)	-18	-7	16	-7	-24	-11	0
Pour Point (°C)	-37.5	-28	12	-12	-38	-42	-18
CFPP (°C)	-34	-23	12	-7	-35	-24	-14
LFTT (°C)	-	-	-	-	-	-	-
D86 Distillation							
IBP	153	154	204	168	171	180	178
10%	173	199	238	211	200	220	210
20%	185	222	251	225	210	234	225
50%	230	275	283	267	242	277	271
95% (90%)*	314*	336*	354*	337*	309	342	361
FBP	340	363	384	369	325	350	374
Sulphur (mg/kg)	260	298	1048	378	33	37	279
HFRR (µm)	493	380	367	499	359	399	448
Wax content (wt%) at 10°C Below Cloud	2.1	-	4.6	2.1	1.7	1.7	1.9
Calculated Cetane Index <small>4Variable</small>	50.7	54.2	58.2	52.8	48.1	55.9	51.4
Cetane number	51.0	-	65.2	53.5	53.3	51.9	52.7



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# WORLDWIDE DIESEL FUEL SURVEY - 5

## Physical inspection data

## Mean values

Country	Romania	Singapore	Slovakia	South Africa	Spain	Sweden	Switzerland
Number of samples	3	6	1	5	12	7	5
Density (kg/m <sup>3</sup> @ 15°C)	839.2	849.0	839.6	848.6	838.4	813.8	830.1
KV (cSt at 40°C)	2.58	4.29	2.59	3.11	2.72	1.95	2.34
KV (cSt at 30°C)	-	-	-	-	-	-	-
KV (cSt at 20°C)	4.06	7.26	4.00	4.93	4.23	2.81	3.55
Cloud Point (°C)	-6	9	-10	2	-2	-33	-13
Pour Point (°C)	-24	5	-36	-10	-19	-38	-34
CFPP (°C)	-12	6	-28	-5	-13	-37	-22
LIFT (°C)	-	-	-	-	-	-	-
D86 Distillation							
IBP	178	205	179	174	166	187	162
10%	211	247	211	222	205	208	204
20%	222	264	220	237	220	214	216
50%	262	301	260	277	269	233	254
95% (90%)*	352	363*	340	348*	354	279	332
FBP	363	384	351	378	365	292	342
Sulphur (mg/kg)	946	342	276	2080	291	5	199
HFRR (µm)	464	354	422	403	397	359	413
Wax content (wt%) at 10°C Below Cloud	1.8	2.4	1.5	2.0	1.8	4.5	1.9
Calculated Cetane Index <small>4Variable</small>	49.7	55.8	49.4	49.6	51.1	52.6	51.7
Cetane number	48.7	52.9	50.8	50.4	51.8	53.2	53.2



# WORLDWIDE DIESEL FUEL SURVEY - 6

## Physical inspection data

## Mean values

Country	Thailand	United Kingdom	USA - EAST	USA - MIDWEST	USA - WEST		
Number of samples	6	12	10	19	9		
Density (kg/m <sup>3</sup> @ 15°C)	838.7	832.9	847.5	854.1	836.9		
KV (cSt at 40°C)	3.14	2.56	2.43	2.77	2.34		
KV (cSt at 30°C)	-	-	-	-	-		
KV (cSt at 20°C)	5.05	3.94	3.68	4.38	3.70		
Cloud Point (°C)	5	-9	-12	-15	-13		
Pour Point (°C)	-2	-26	-30	-26	-22		
CFPP (°C)	2	-18	-22	-19	-16		
LTFT (°C)	-	-	-16	-18	-14		
D86 Distillation							
IBP	179	169	179	189	185		
10%	218	207	207	218	208		
20%	235	222	220	230	218		
50%	277	266	260	264	249		
95% (90%)*	348*	340	321*	320*	313*		
FBP	373	350	348	350	345		
Sulphur (mg/kg)	330	42	357	376	267		
HFRR (µm)	-	377	395	493	519		
Wax content							
(wt%) at 10°C Below Cloud	2.6	2.1	1.9	1.7	2.1		
Calculated Cetane Index <sup>4Variable</sup>	53.1	52.7	45.9	45.1	47.9		
Cetane number	55.1	53.7	44.7	43.8	51.6		



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# AUSTRIA

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30626/02	30627/02	30628/02	30629/02	30630/02				
Cloud Point (°C)		-10	-9	-7	-7	-9	-9	-9	-10				
Pour Point (°C)		-33	-29	-24	-24	-30	-27	-33	-30				
CFPP (°C)	-20 (max)	-31	-25	-21	-21	-23	-27	-31	-22				
HFRR (µm)	460 (max)	312	373	456	312	393	456	380	326				
Wax Content (wt%) at 10°C Below Cloud		1.4	1.8	2.1	1.4	2.1	2.0	1.6	2.0				
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	826.4	832.8	838.9	826.6	834.1	826.4	837.8	838.9				
Sulphur (mg/Kg)	350 (max)	58	249	334	334	298	58	282	274				
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.10	2.47	2.74	2.38	2.53	2.10	2.59	2.74				
Viscosity @ 20°C (cSt)		3.10	3.77	4.28	3.61	3.88	3.10	3.99	4.28				
IBP		162	172	179	175	162	171	171	179				
T <sub>10</sub>		194	203	214	205	198	194	203	214				
T <sub>20</sub>		204	218	230	219	217	204	219	230				
T <sub>50</sub>		243	259	268	258	264	243	262	268				
T <sub>95</sub>	360 (max)	333	343	350	344	350	333	346	341				
FBP		346	355	362	357	362	346	356	353				
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.7	51.1	53.7	53.7	51.2	49.7	49.8	51.2				
Cetane Number	51 (min)	52.8	54.2	55.8	55.6	53.6	55.8	53.3	52.8				

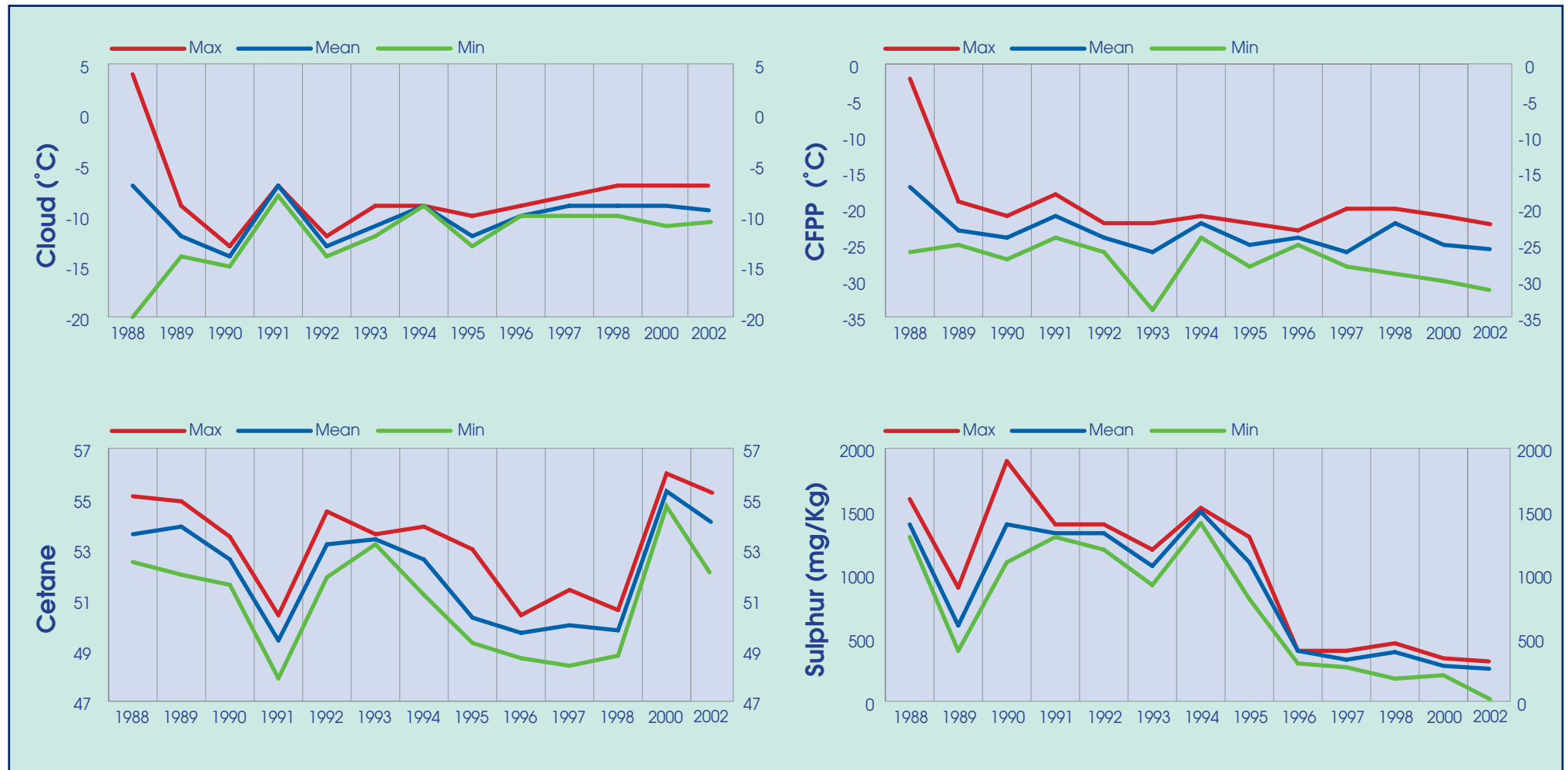


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# AUSTRIA - Key Trends



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# BENELUX

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30506/02	30507/02	30508/02	30509/02	30510/02	30511/02	30512/02	30513/02	
Cloud Point (°C)		-15	-8	-6	-6	-6	-8	-15	-7	-12	-7	-6	
Pour Point (°C)		-36	-28	-18	-21	-36	-24	-36	-27	-36	-24	-18	
CFPP (°C)	-20	-28	-20	-15	-20	-22	-20	-20	-20	-28	-20	-15	
HFRR (µm)	460 (max)	356	411	457	412	408	457	415	401	356	416	423	
Wax Content (wt%) at 10°C Below Cloud		0.8	1.5	1.9	1.6	1.4	1.3	1.8	1.7	0.8	1.2	1.9	
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	823.6	834.7	843.6	838.1	830.7	823.6	843.6	823.8	843.6	836.3	837.8	
Sulphur (mg/Kg)	50 (max)	31	35	42	32	42	32	32	39	32	37	31	
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.18	2.56	2.78	2.65	2.48	2.46	2.78	2.47	2.77	2.18	2.74	
Viscosity @ 20°C (cSt)		3.27	3.96	4.39	4.12	3.79	3.74	4.39	3.75	4.34	3.27	4.26	
IBP		149	166	187	166	158	169	174	163	187	149	166	
T <sub>10</sub>		188	206	223	206	195	209	218	204	223	188	205	
T <sub>20</sub>		200	219	232	221	208	221	232	216	231	200	220	
T <sub>50</sub>		253	264	271	270	262	262	271	263	260	253	269	
T <sub>95</sub>	360 (max)	330	344	352	349	352	345	330	346	342	346	345	
FBP		341	355	360	359	360	356	341	355	351	358	358	
Calculated Cetane Index <small>4Variable</small>	46 (min)	47.7	51.6	56.0	51.4	52.0	56.0	49.9	55.8	49.0	47.7	51.2	
Cetane Number	51 (min)	50.1	52.7	56.7	51.5	52.9	56.7	50.1	56.4	50.6	50.8	52.7	

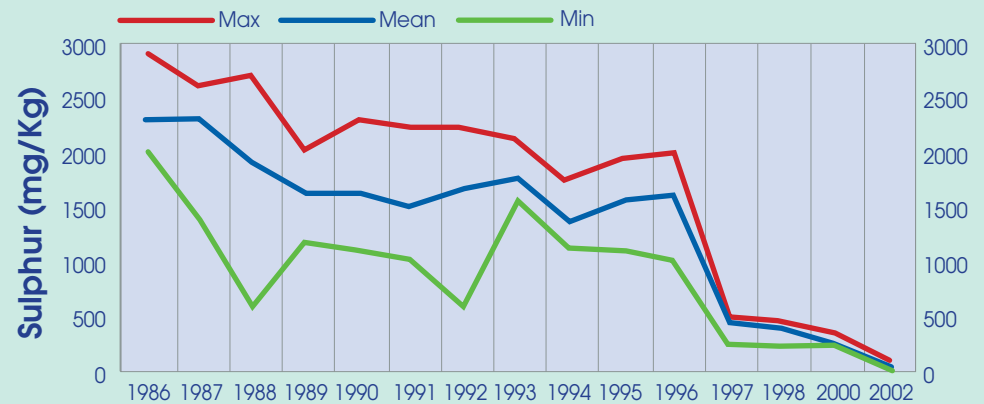
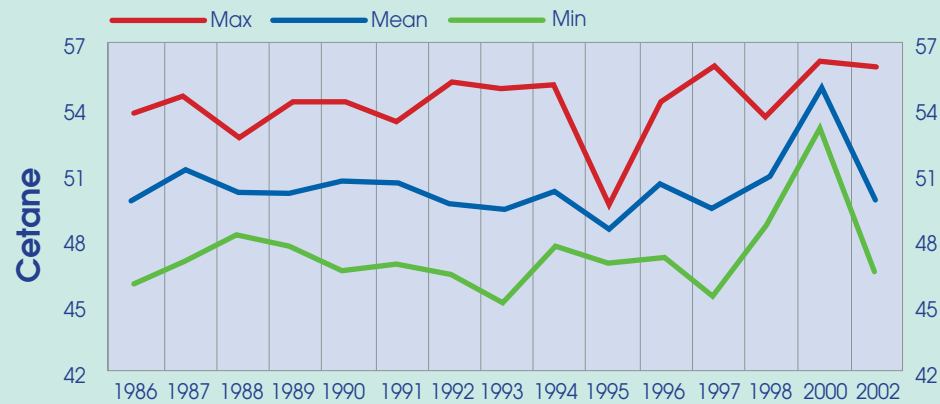
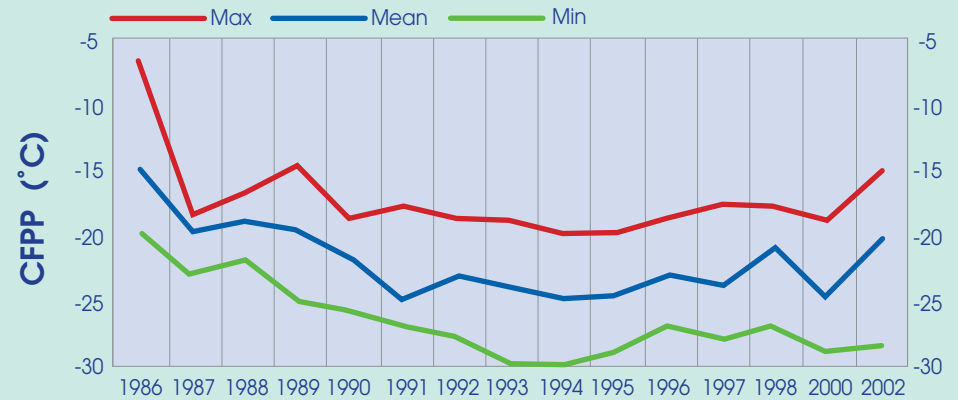
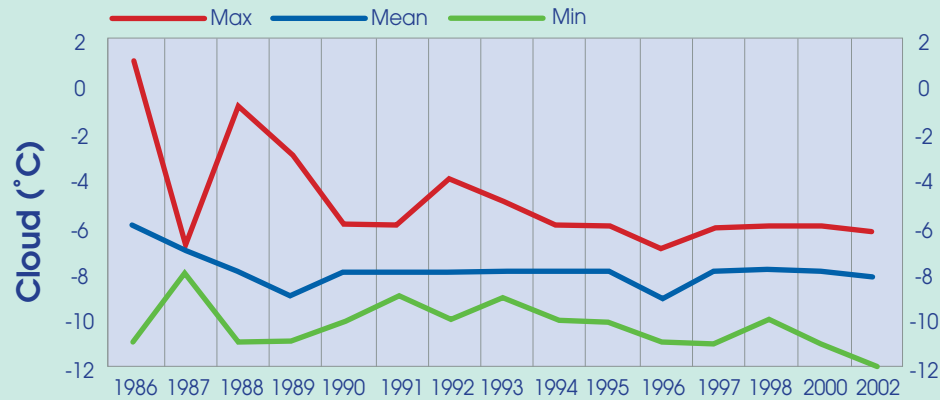
50mg/kg sulphur limit provides tax incentive versus EN590



Contents



# BENELUX - Key Trends



Contents



# CZECH REPUBLIC

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30521/02	30522/02	30523/02						
Cloud Point (°C)		-11	-10	-9	-11	-9	-9						
Pour Point (°C)		-39	-34	-30	-30	-39	-33						
CFPP (°C)	-20(max)	-27	-24	-20	-26	-20	-27						
HFRR (µm)	460 (max)	413	425	434	427	413	434						
Wax Content (wt%) at 10°C Below Cloud		1.4	1.6	1.8	1.5	1.8	1.4						
Density (kg/m <sup>3</sup> @ 15°C)	820 - 860	830.2	836.7	844.0	836.0	844.0	830.2						
Sulphur (mg/Kg)	350 (max)	187	229	278	187	222	278						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.43	2.57	2.66	2.66	2.63	2.43						
Viscosity @ 20°C (cSt)		3.68	3.96	4.14	4.14	4.07	3.68						
IBP		156	174	192	192	174	156						
T <sub>10</sub>		197	209	217	217	212	197						
T <sub>20</sub>		206	217	223	223	223	206						
T <sub>50</sub>		256	260	262	261	262	256						
T <sub>95</sub>	360 (max)	336	341	344	336	342	344						
FBP		348	353	357	348	353	357						
Calculated Cetane Index <small>4Variable</small>	46 (min)	48.2	50.2	51.3	51.3	48.2	51.2						
Cetane Number	51 (min)	50.0	51.1	51.9	51.3	50.0	51.9						



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# CZECH REPUBLIC - Key Trends



Contents



# DENMARK

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30528/02	30529/02							
Cloud Point (°C)		-15	-13	-10	-10	-15							
Pour Point (°C)		-42	-41	-39	-39	-42							
CFPP (°C)	-20 (max)	-31	-30	-28	-28	-31							
HFRR (µm)	460 (max)	373	405	437	373	437							
Wax Content (wt%) at 10°C Below Cloud		0.6	1.0	1.3	1.3	0.6							
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	843.4	843.8	844.2	843.4	844.2							
Sulphur (mg/Kg)	50 (max)	42	48	53	53	42							
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.51	2.57	2.62	2.62	2.51							
Viscosity @ 20°C (cSt)		3.86	3.96	4.06	4.06	3.86							
IBP		158	158	159	159	158							
T <sub>10</sub>		198	203	207	207	198							
T <sub>20</sub>		212	218	225	225	212							
T <sub>50</sub>		260	263	266	266	260							
T <sub>95</sub>	360 (max)	347	350	353	347	353							
FBP		354	358	363	354	363							
Calculated Cetane Index <small>4Variable</small>	46 (min)	46.9	47.8	48.7	48.7	46.9							
Cetane Number	51 (min)	50.4	51.9	53.4	53.4	50.4							

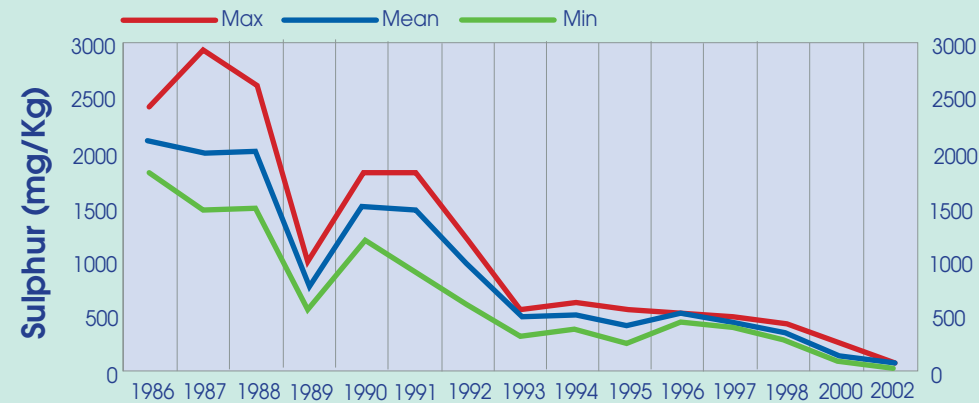
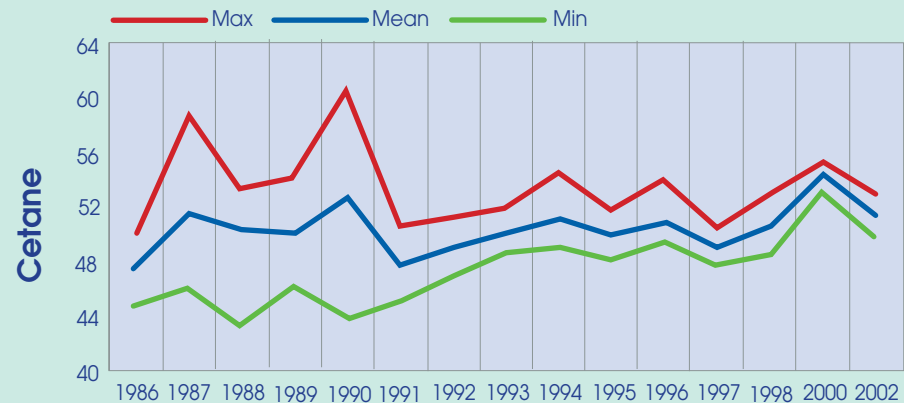
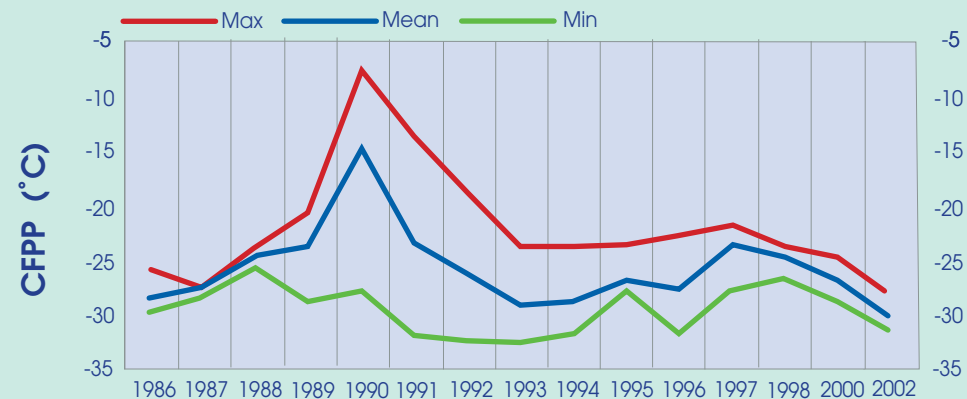
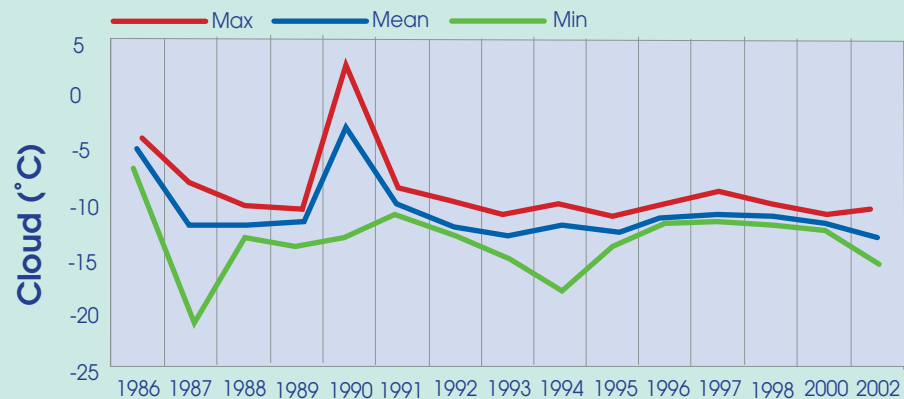
50mg/kg sulphur limit provides tax incentive versus EN590



Contents



# DENMARK - Key Trends



Contents



# FINLAND

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30556/02	30557/02	30558/02	30559/02	30560/02				
Cloud Point (°C)	-29 (max)	-29	-28	-24	-29	-28	-29	-29	-24				
Pour Point (°C)		-45	-43	-39	-45	-42	-45	-45	-39				
CFPP (°C)	-34 (max)	-46	-43	-32	-46	-44	-45	-46	-32				
HFRR (µm)	460 (max)	407	422	452	452	414	430	407	408				
Wax Content (wt%) at 10°C Below Cloud		0.7	0.9	1.4	0.8	0.7	0.7	0.7	1.4				
Density (kg/m <sup>3</sup> @ 15°C)	800 - 820	818.0	824.5	826.3	825.9	826.3	826.1	826.3	818.0				
Sulphur (mg/Kg)	50 (max)	16	23	43	16	20	18	17	43				
Viscosity @ 40°C (cSt)	1.4 - 2.6	1.77	1.99	2.07	2.07	2.03	2.06	2.03	1.77				
Viscosity @ 20°C (cSt)		2.53	2.92	3.06	3.06	2.98	3.04	2.99	2.53				
IBP		167	176	180	180	178	179	178	167				
T <sub>10</sub>	180 (min)	191	203	208	208	206	206	205	191				
T <sub>20</sub>		196	210	215	215	213	214	212	196				
T <sub>50</sub>		223	235	239	239	238	239	237	223				
T <sub>95</sub>	310 (max)	301	308	317	305	301	310	309	317				
FBP		317	322	329	319	317	322	323	329				
Calculated Cetane Index <small>4Variable</small>	46 (min)	48.0	49.0	49.8	49.8	48.9	49.5	48.8	48.0				
Cetane Number	51 (min)	52.3	52.6	53.0	52.3	52.3	53.0	52.6	52.9				

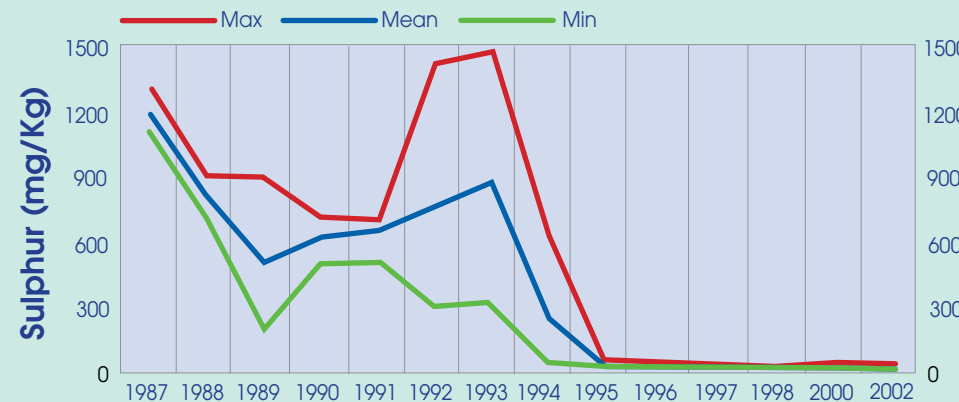
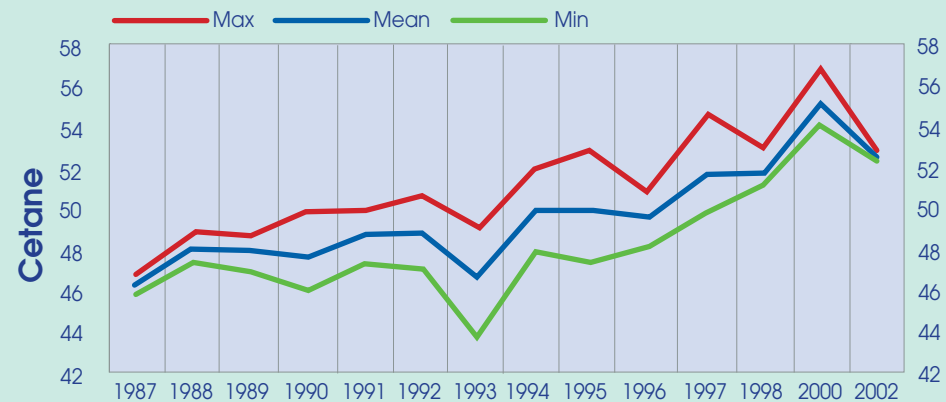
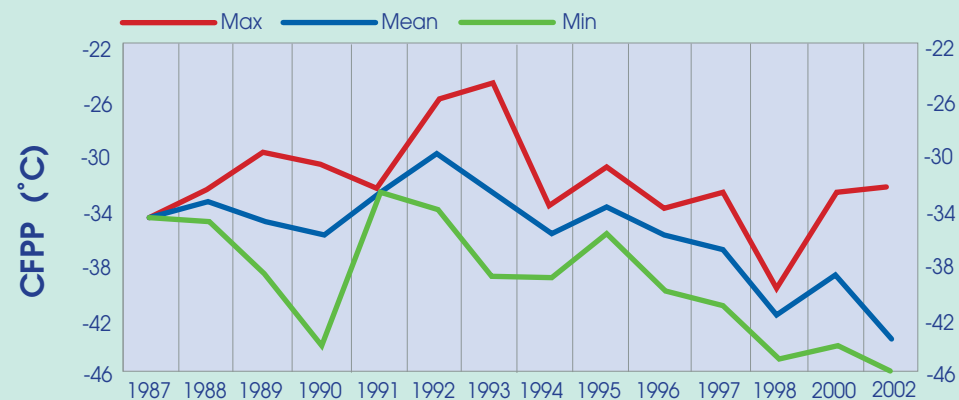
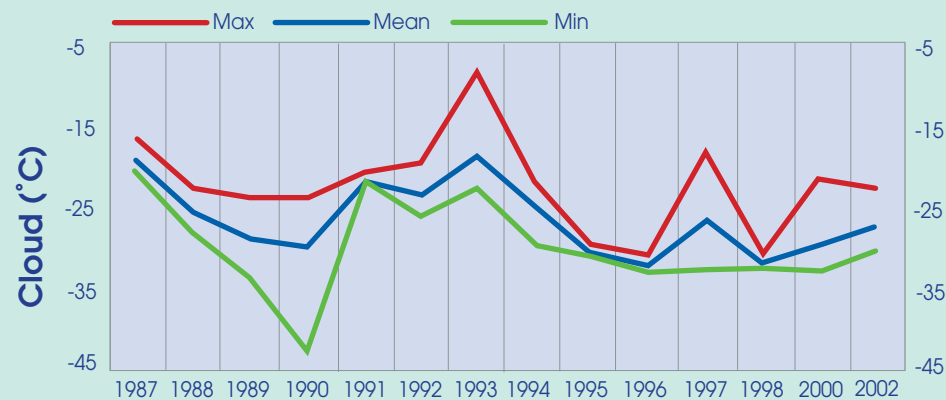
Specification shown combines the higher specification aspects of Reformulated Diesel and EN590

Provides tax incentive versus EN590





# FINLAND - Key Trends



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# FRANCE - 1

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30740/02	30741/02	30742/02	30743/02	30744/02	30745.02	30746/02	30747/02	30748/02
Cloud Point (°C)	-5 (max)	-9	-6	-4	-5	-7	-5	-7	-5	-6	-5	-5	-5
Pour Point (°C)		-33	-29	-24	-27	-27	-33	-27	-24	-30	-27	-30	-30
CFPP (°C)	-15 (max)*	-25	-20	-16	-20	-19	-19	-19	-18	-21	-17	-16	-19
HFRR (µm)	460 (max)	218	311	399	237	218	366	348	340	355	399	259	242
Wax Content (wt%) at 10°C Below Cloud		1.2	1.7	2.0	1.7	1.6	1.6	1.9	2.0	1.7	2.0	1.7	1.6
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	829.8	834.5	841.0	834.4	837.5	834.1	831.0	831.2	840.6	831.5	829.8	837.0
Sulphur (mg/Kg)	350 (max)	44	276	347	305	287	317	344	347	202	283	259	306
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.11	2.38	2.68	2.50	2.68	2.31	2.32	2.35	2.53	2.30	2.28	2.41
Viscosity @ 20°C (cSt)		3.13	3.61	4.15	3.80	4.15	3.45	3.49	3.56	3.91	3.47	3.43	3.65
IBP		151	161	176	158	176	151	164	161	162	160	154	158
T <sub>10</sub>		189	195	210	193	210	192	193	198	199	192	191	195
T <sub>20</sub>		202	210	227	213	227	206	209	210	218	209	203	207
T <sub>50</sub>		247	259	269	265	269	257	257	258	264	261	255	261
T <sub>95</sub>	360 (max)	344	351	356	350	352	352	351	351	349	352	356	352
FBP		354	359	364	361	358	359	355	360	358	357	364	358
Calculated Cetane Index <sub>4Variable</sub>	46 (min)	47.2	50.1	51.7	51.0	51.7	49.6	50.7	51.3	48.7	51.4	50.8	49.5
Cetane Number	51 (min)	50.0	51.5	53.3	50.3	53.3	52.6	52.3	51.3	51.0	52.2	50.0	50.9

\*Specification for Gazole-Hiver. Grand-Froid is -20°C



Contents



# FRANCE - 2

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30749/02	30750/02	30751/02						
Cloud Point (°C)	-5 (max)	-9	-6	-4	-9	-4	-6						
Pour Point (°C)		-33	-29	-24	-27	-33	-27						
CFPP (°C)	-15 (max)*	-25	-20	-16	-23	-25	-18						
HFRR (µm)	460 (max)	218	311	399	384	323	256						
Wax Content (wt%) at 10°C Below Cloud		1.2	1.7	2.0	1.2	1.8	1.7						
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	829.8	834.5	841.0	835.0	831.0	841.0						
Sulphur (mg/Kg)	350 (max)	44	276	347	44	335	281						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.11	2.38	2.68	2.11	2.36	2.44						
Viscosity @ 20°C (cSt)		3.13	3.61	4.15	3.13	3.56	3.72						
IBP		151	161	176	165	156	164						
T <sub>10</sub>		189	195	210	189	196	194						
T <sub>20</sub>		202	210	227	202	207	212						
T <sub>50</sub>		247	259	269	247	254	265						
T <sub>95</sub>	360 (max)	344	351	356	344	352	351						
FBP		354	359	364	354	362	361						
Calculated Cetane Index <small>4Variable</small>	46 (min)	47.2	50.1	51.7	47.2	50.4	48.5						
Cetane Number	51 (min)	50.0	51.5	53.3	51.5	51.0	52.1						

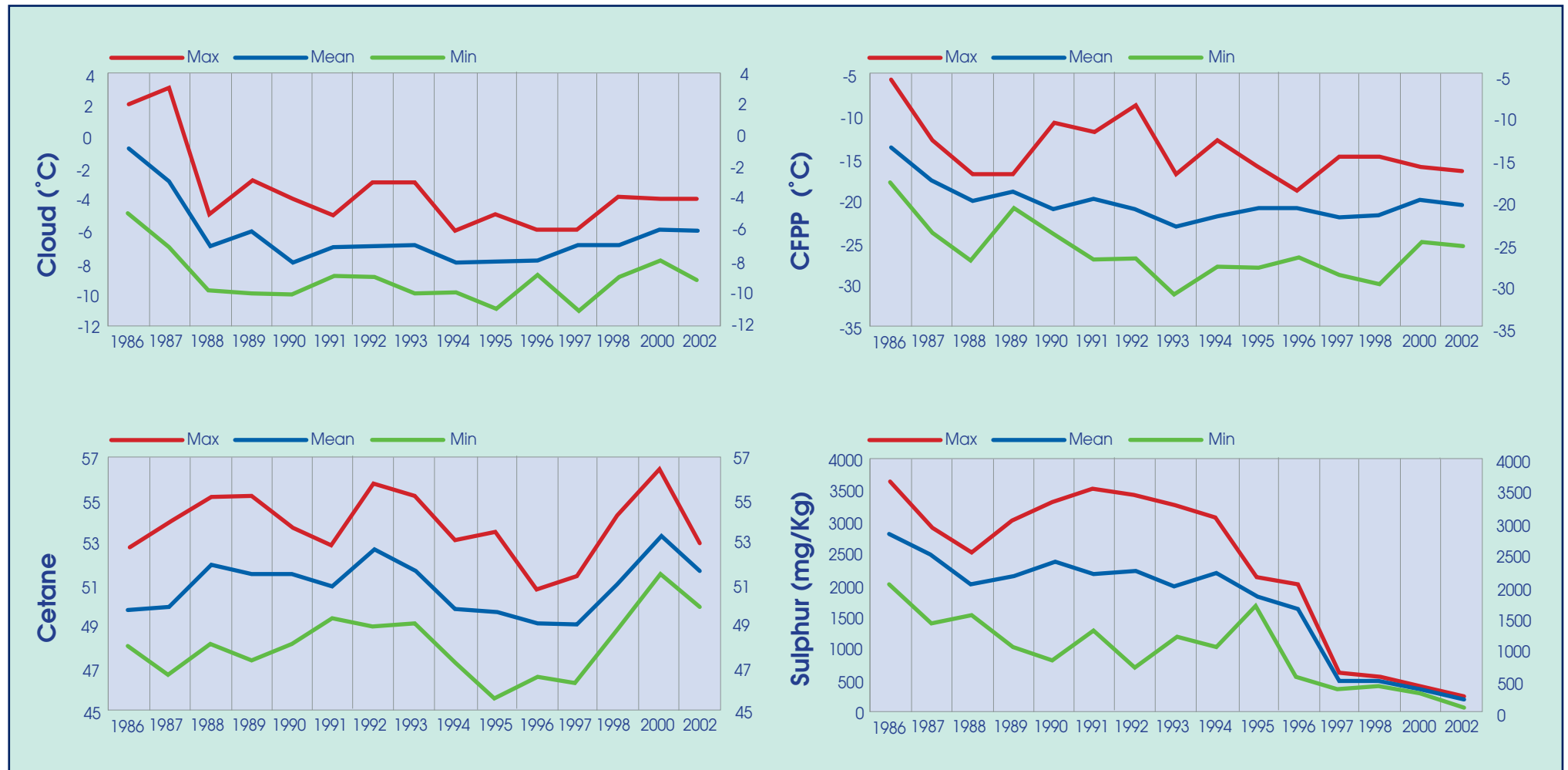
\*Specification for Gazole-Hiver. Grand-Froid is -20°C



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# FRANCE - Key Trends



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# GERMANY - 1

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30600/02	30602/02	30603/02	30604/02	30605/02	30606/02	30607/02	30608/02	30609/02
Cloud Point (°C)		-11	-8	-6	-9	-7	-6	-8	-8	-7	-7	-8	-6
Pour Point (°C)		-36	-28	-21	-33	-27	-21	-27	-24	-27	-27	-30	-36
CFPP (°C)	-22 (max)	-31	-25	-19	-26	-28	-26	-27	-25	-21	-31	-25	-19
HFRR (µm)	460 (max)	243	397	464	360	407	445	407	445	450	395	371	452
Wax Content (wt%) at 10°C Below Cloud		0.7	1.5	2.2	1.7	1.1	1.2	1.3	1.7	1.8	1.1	1.3	1.7
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	823.5	830.4	837.7	827.7	837.7	829.6	834.1	825.4	835.5	833.7	834.5	824.0
Sulphur (mg/Kg)	50 (max)	5	33	49	22	31	17	38	40	48	41	36	41
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.02	2.48	3.48	2.42	2.49	2.57	2.48	2.15	2.39	2.50	2.37	2.25
Viscosity @ 20°C (cSt)		2.95	3.78	5.67	3.67	3.80	3.94	3.79	3.14	3.62	3.81	3.60	3.36
IBP		162	175	195	169	177	177	165	168	169	173	162	177
T <sub>10</sub>		191	206	240	204	206	207	199	195	203	205	194	203
T <sub>20</sub>		202	218	256	217	216	221	216	207	216	219	210	212
T <sub>50</sub>		240	258	286	257	259	264	263	245	257	261	262	244
T <sub>95</sub>	360 (max)	335	345	356	340	351	350	345	335	345	348	351	343
FBP		347	357	366	352	364	361	358	349	357	361	361	354
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.6	52.2	62.0	52.9	49.6	53.7	51.2	50.7	49.7	51.3	50.4	51.5
Cetane Number	51 (min)	50.0	55.1	63.2	54.6	50.0	57.9	53.4	54.8	55.5	54.8	51.5	53.5



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# GERMANY - 2

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30610/02	30611/02	30612/02	30613/02	30615/02	30616/02	30617/02	30618/02	30619/02
Cloud Point (°C)		-11	-8	-6	-9	-8	-7	-6	-9	-8	-9	-11	-6
Pour Point (°C)		-36	-28	-21	-30	-27	-33	-24	-27	-27	-27	-27	-27
CFPP (°C)	-22 (max)	-31	-25	-19	-26	-31	-27	-19	-27	-29	-27	-31	-25
HFRR (µm)	460 (max)	243	397	464	443	266	419	376	464	435	319	243	457
Wax Content (wt%) at 10°C Below Cloud		0.7	1.5	2.2	1.6	0.7	1.2	2.0	2.2	1.4	1.9	1.4	1.4
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	823.5	830.4	837.7	833.6	837.6	823.7	830.5	823.5	833.3	824.1	831.8	828.3
Sulphur (mg/Kg)	50 (max)	5	33	49	25	39	25	40	39	31	49	43	24
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.02	2.48	3.48	2.82	2.70	2.35	2.41	2.02	2.58	2.28	2.19	2.65
Viscosity @ 20°C (cSt)		2.95	3.78	5.67	4.43	4.19	3.54	3.65	2.95	3.97	3.42	3.26	4.09
IBP		162	175	195	187	168	178	182	172	183	164	171	192
T <sub>10</sub>		191	206	240	218	214	199	209	195	211	191	202	217
T <sub>20</sub>		202	218	256	233	230	209	219	202	220	204	212	225
T <sub>50</sub>		240	258	286	271	266	248	257	240	263	254	251	260
T <sub>95</sub>	360 (max)	335	345	356	340	348	350	341	335	345	356	336	349
FBP		347	357	366	348	359	360	353	347	356	366	349	361
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.6	52.2	62.0	54.3	51.3	52.2	52.3	50.3	51.2	52.6	49.9	54.4
Cetane Number	51 (min)	50.0	55.1	63.2	58.0	52.5	57.3	53.8	55.4	57.3	52.9	51.5	59.7



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# GERMANY - 3

## National standards and physical inspection data

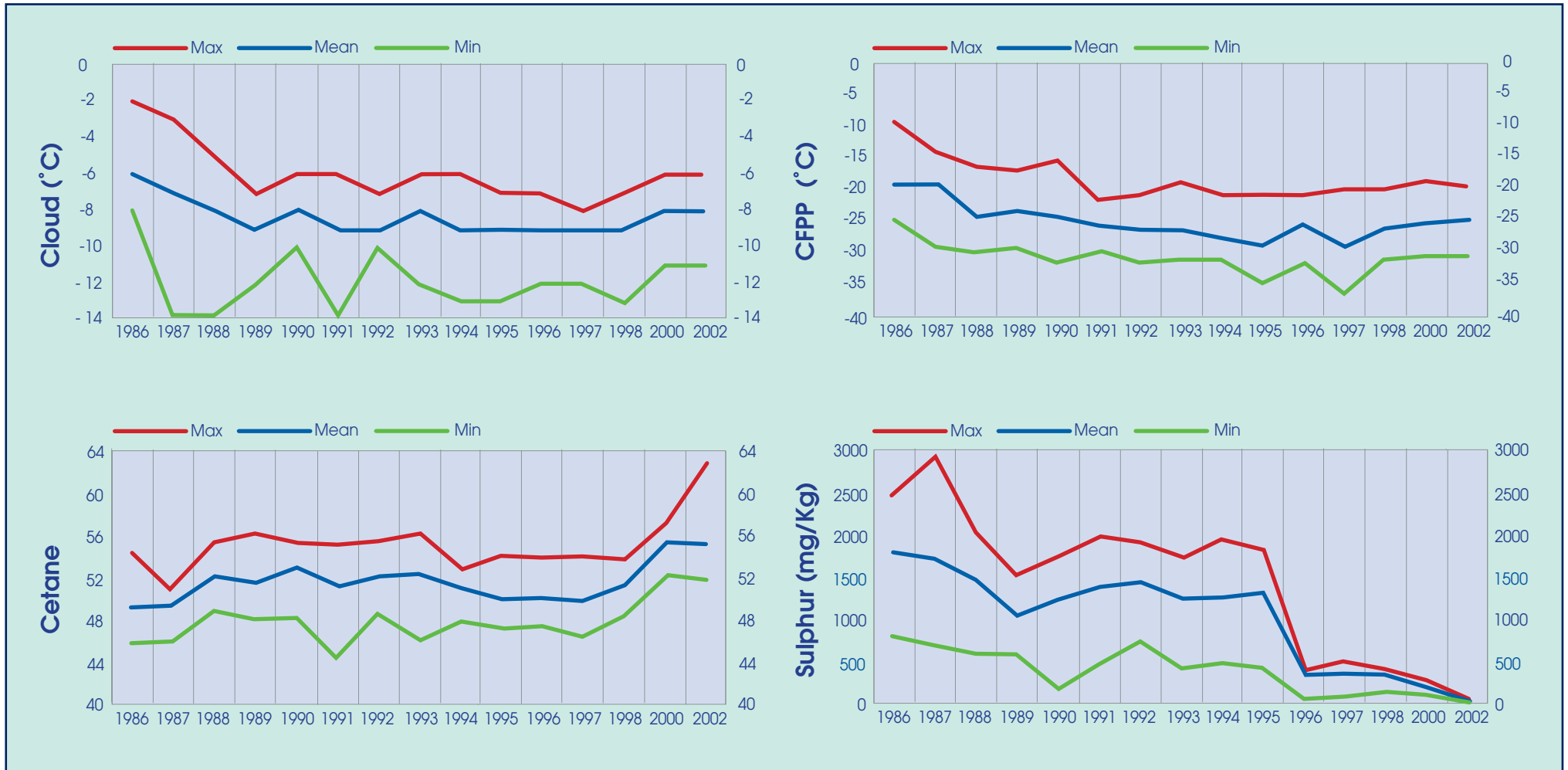
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30620/02								
Cloud Point (°C)		-11	-8	-6	-10								
Pour Point (°C)		-36	-28	-21	-24								
CFPP (°C)	-22 (max)	-31	-25	-19	-22								
HFRR (µm)	460 (max)	243	397	464	386								
Wax Content (wt%) at 10°C Below Cloud		0.7	1.5	2.2	2.1								
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	823.5	830.4	837.7	828.2								
Sulphur (mg/Kg)	50 (max)	5	33	49	5								
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.02	2.48	3.48	3.48								
Viscosity @ 20°C (cSt)		2.95	3.78	5.67	5.67								
IBP		162	175	195	195								
T <sub>10</sub>		191	206	240	240								
T <sub>20</sub>		202	218	256	256								
T <sub>50</sub>		240	258	286	286								
T <sub>95</sub>	360 (max)	335	345	356	353								
FBP		347	357	366	364								
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.6	52.2	62.0	62.0								
Cetane Number	51 (min)	50.0	55.1	63.2	63.2								



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# GERMANY - Key Trends



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# GREECE

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30153/02	30225/02	30230/02						
Cloud Point (°C)		-2	1	3	2	-2	3						
Pour Point (°C)		-18	-13	-6	-6	-15	-18						
CFPP (°C)	-5 (max)	-11	-9	-7	-7	-11	-9						
HFRR (µm)	460 (max)	442	473	489	489	442	487						
Wax Content (wt%) at 10°C Below Cloud		2.3	2.7	3.0	3.0	2.3	2.9						
Density (kg/m <sup>3</sup> @ 15°C)	845 (max)	827.3	836.8	841.7	827.3	841.7	841.5						
Sulphur (mg/Kg)	350 (max)	232	301	348	324	348	232						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.84	3.28	3.77	2.84	3.24	3.77						
Viscosity @ 20°C (cSt)		4.44	5.32	6.28	4.44	5.24	6.28						
IBP		168	189	204	168	194	204						
T <sub>10</sub>		216	232	245	216	235	245						
T <sub>20</sub>		235	249	261	235	250	261						
T <sub>50</sub>		276	284	292	276	284	292						
T <sub>95</sub>	360 (max)	351	355	360	351	353	360						
FBP		365	366	367	365	366	367						
Calculated Cetane Index <small>4Variable</small>	46 (min)	54.9	56.8	58.0	58.0	54.9	57.5						
Cetane Number	51 (min)	54.5	56.0	58.0	58.0	55.6	54.5						



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# GREECE - Key Trends



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# HUNGARY

## National standards and physical inspection data

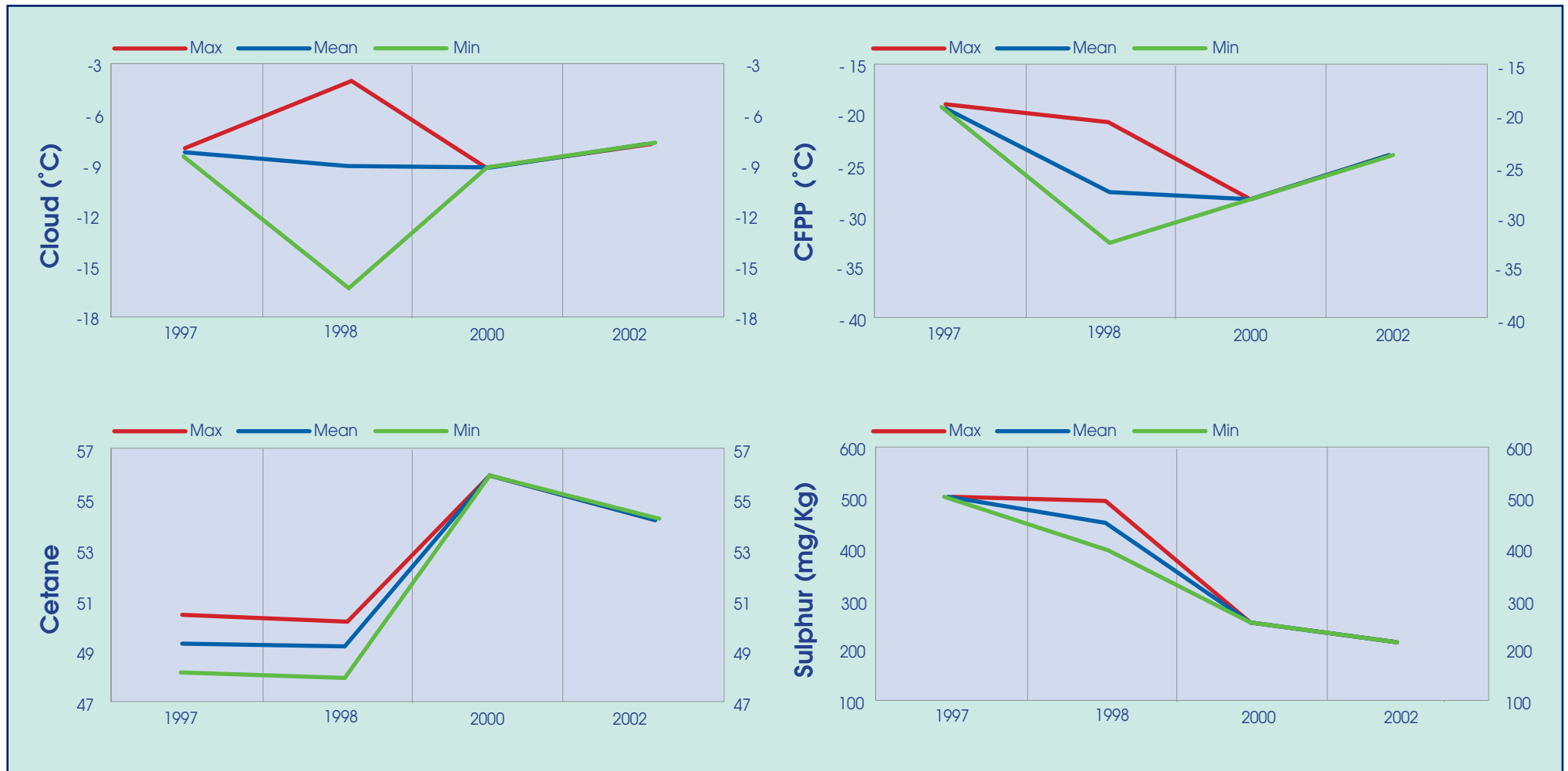
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30563/02								
Cloud Point (°C)			-8		-8								
Pour Point (°C)			-24		-24								
CFPP (°C)	-20 (max)		-24		-24								
HFRR (µm)			424		424								
Wax Content (wt%) at 10°C Below Cloud			1.4		1.4								
Density (kg/m <sup>3</sup> @ 15°C)	820 - 860		838.0		838.0								
Sulphur (mg/Kg)	500 (max)		210		210								
Viscosity @ 40°C (cSt)	3.0 - 8.0		4.17		4.17								
Viscosity @ 20°C (cSt)			2.69		2.69								
IBP			181		181								
T <sub>10</sub>			214		214								
T <sub>20</sub>			226		226								
T <sub>50</sub>			266		266								
T <sub>95</sub>			351		351								
FBP			364		364								
Calculated Cetane Index <small>4Variable</small>			51.3		51.3								
Cetane Number	48 (min)		54.8		54.8								



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# HUNGARY - Key Trends



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# IRELAND

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30960/02	30961/02	30962/02	30963/02	30964/02	30965/02	30966/02		
Cloud Point (°C)		-16	-11	-7	-8	-14	-7	-7	-15	-16	-9		
Pour Point (°C)		-30	-26	-21	-27	-21	-27	-27	-21	-30	-27		
CFPP (°C)	-12 (max)	-25	-21	-16	-22	-23	-19	-16	-25	-17	-23		
HFRR (µm)	460 (max)	327	379	466	327	352	352	380	466	423	352		
Wax Content (wt%) at 10°C Below Cloud		0.9	1.6	2.3	1.6	1.5	2.0	1.7	2.3	0.9	1.1		
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	826.7	836.0	841.7	837.4	837.3	840.2	835.4	833.2	826.7	841.7		
Sulphur (mg/Kg)	50 (max)*	42	62	102	53	66	102	71	42	54	49		
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.49	2.68	3.03	2.84	2.53	3.03	2.49	2.49	2.65	2.73		
Viscosity @ 20°C (cSt)		3.81	4.17	4.83	4.47	3.89	4.83	3.81	3.83	4.11	4.27		
IBP		170	183	207	207	170	200	172	176	187	171		
T <sub>10</sub>		203	216	236	233	208	236	203	211	213	207		
T <sub>20</sub>		219	230	247	240	226	247	219	228	225	226		
T <sub>50</sub>		260	265	272	264	264	272	260	262	263	268		
T <sub>95</sub>	360 (max)	325	339	346	342	334	343	344	325	337	346		
FBP		343	353	364	354	351	354	357	343	348	364		
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.5	52.0	55.2	53.0	50.4	53.5	50.4	51.9	55.2	49.5		
Cetane Number	51 (min)	52.3	53.9	55.2	54.6	52.7	55.2	53.2	54.4	55.1	52.3		

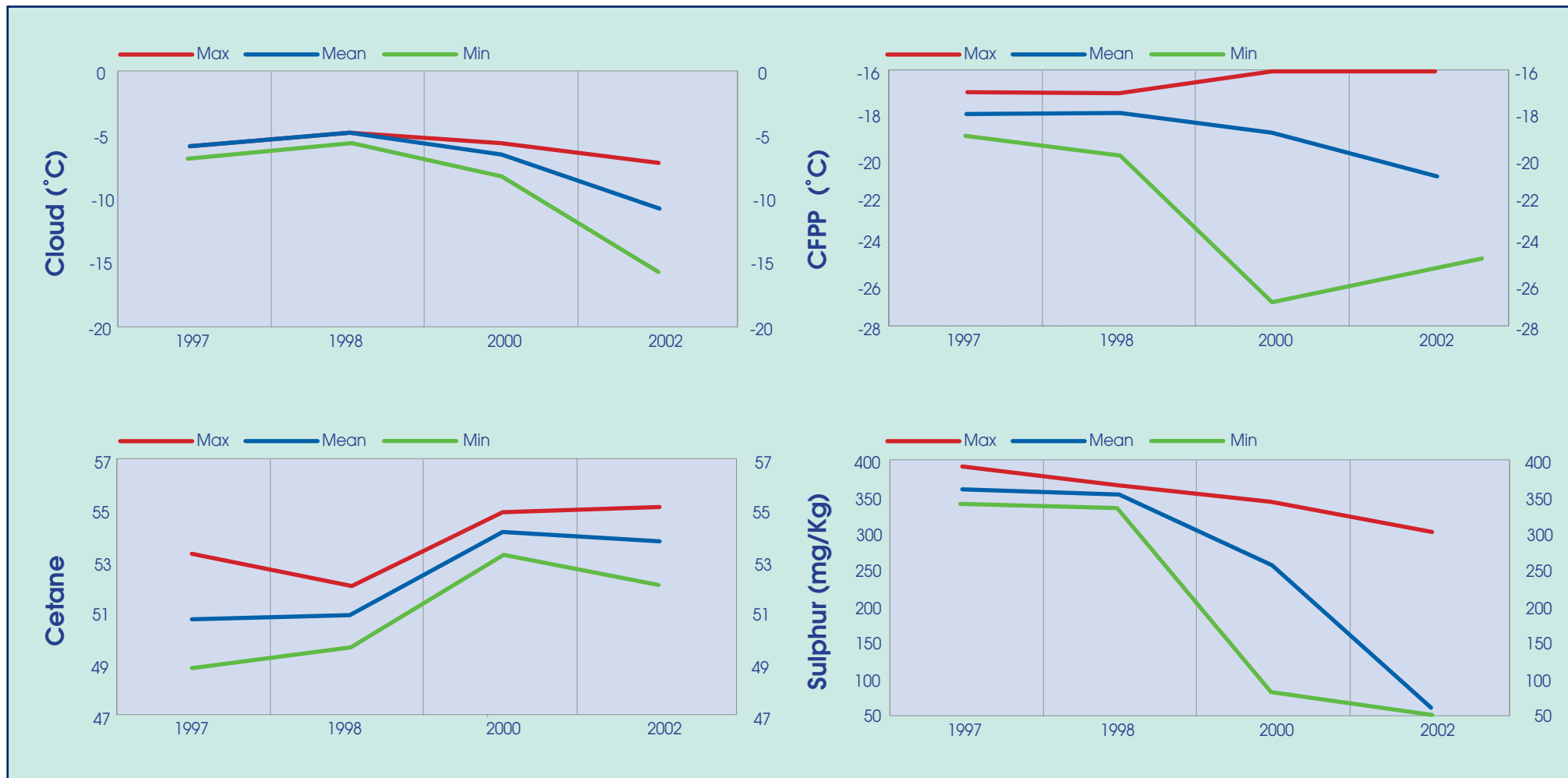
\* Samples collected during transition between 350mg/kg and 50mg/kg specifications



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# IRELAND - Key Trends



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# ITALY - 1

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30752/02	30753/02	30754/02	30756/02	30757/02	30758/02	30760/02	30761/02	30762/02
Cloud Point (°C)		-6	-2	1	-1	-3	-2	-6	-6	-1	0	1	-5
Pour Point (°C)		-24	-20	-18	-18	-24	-21	-18	-18	-24	-18	-21	-18
CFPP (°C)	-12 (max)	-16	-13	-10	-16	-16	-13	-15	-11	-15	-14	-13	-11
HFRR (µm)	460 (max)	307	406	548	433	429	425	344	425	307	346	316	455
Wax Content (wt%) at 10°C Below Cloud		1.2	1.9	2.5	2.0	1.2	1.8	2.1	1.9	1.2	1.7	2.5	2.2
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	827.4	835.2	842.1	842.1	829.7	833.0	836.7	838.7	841.7	841.3	832.5	827.8
Sulphur (mg/Kg)	350 (max)	136	265	334	183	283	306	287	182	312	334	305	315
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.34	2.66	3.35	2.72	2.42	2.47	2.44	2.55	2.52	3.35	2.98	2.56
Viscosity @ 20°C (cSt)		3.52	4.19	5.70	4.24	3.67	3.77	3.71	3.91	3.87	5.39	5.70	3.91
IBP		160	170	191	174	160	165	164	169	171	181	169	160
T <sub>10</sub>		194	204	228	206	196	194	198	203	198	221	212	195
T <sub>20</sub>		209	221	246	221	211	209	218	219	212	242	232	212
T <sub>50</sub>		255	268	283	270	260	261	268	266	258	282	281	263
T <sub>95</sub>	360 (max)	345	356	362	356	362	358	351	345	360	360	357	356
FBP		359	370	375	366	375	372	370	363	373	373	369	371
Calculated Cetane Index <small>4Variable</small>	46 (min)	47.5	52.0	56.2	49.9	52.1	50.9	50.9	50.0	47.5	53.3	56.2	53.4
Cetane Number	51 (min)	49.0	51.9	54.9	50.8	51.0	51.4	50.9	49.4	49.0	52.2	53.2	54.3



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# ITALY - 2

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30763/02	30764/02	30765/02	30766/02	30767/02	30768/02			
Cloud Point (°C)		-6	-2	1	-2	0	-6	1	-5	0			
Pour Point (°C)		-24	-20	-18	-18	-21	-21	-18	-18	-18			
CFPP (°C)	-12 (max)	-16	-13	-10	-11	-10	-16	-12	-14	-11			
HFRR (µm)	460 (max)	307	406	548	548	540	331	394	377	425			
Wax Content (wt%) at 10°C Below Cloud		1.2	1.9	2.5	2.2	2.1	1.8	2.5	1.8	1.8			
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	827.4	835.2	842.1	831.3	827.4	836.7	838.3	836.7	833.9			
Sulphur (mg/Kg)	350 (max)	136	265	334	136	238	296	189	298	312			
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.34	2.66	3.35	2.81	2.37	2.34	3.27	2.39	2.71			
Viscosity @ 20°C (cSt)		3.52	4.19	5.70	4.37	3.58	3.52	5.32	3.63	4.21			
IBP		160	170	191	185	169	165	191	160	171			
T <sub>10</sub>		194	204	228	216	199	198	228	195	203			
T <sub>20</sub>		209	221	246	229	211	212	246	214	220			
T <sub>50</sub>		255	268	283	274	255	264	283	267	268			
T <sub>95</sub>	360 (max)	345	356	362	358	359	350	358	351	358			
FBP		359	370	375	370	368	359	373	369	372			
Calculated Cetane Index <small>4Variable</small>	46 (min)	47.5	52.0	56.2	55.7	52.2	50.1	55.4	50.5	52.5			
Cetane Number	51 (min)	49.0	51.9	54.9	54.5	53.1	52.4	54.9	49.2	52.2			



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# ITALY - Key Trends



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# NORWAY

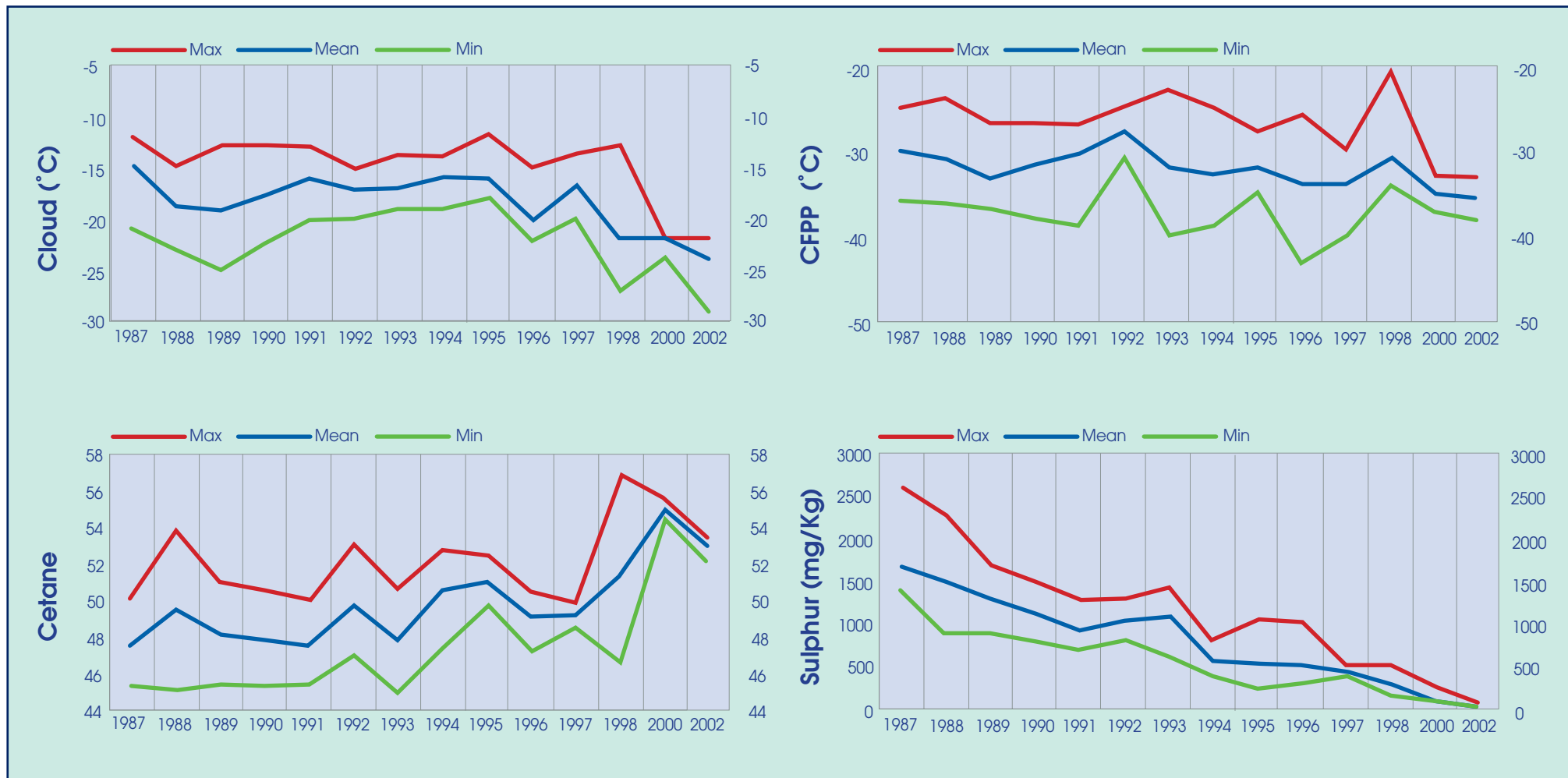
## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30561/02	30562/02	30564/02	30850/02					
Cloud Point (°C)	-22 (max)	-29	-24	-21	-29	-21	-22	-22					
Pour Point (°C)		-45	-38	-30	-30	-42	-45	-36					
CFPP (°C)	-32 (max)	-38	-35	-32	-34	-34	-38	-32					
HFRR (µm)	460 (max)	227	359	415	415	227	387	407					
Wax Content (wt%) at 10°C Below Cloud		1.1	1.7	3.0	3.0	1.3	1.1	1.5					
Density (kg/m <sup>3</sup> @ 15°C)	820 - 840	815.1	830.0	837.6	815.1	832.3	835.1	837.6					
Sulphur (mg/Kg)	50 (max)	20	33	42	42	31	20	40					
Viscosity @ 40°C (cSt)	2.0 - 4.5	1.75	2.07	2.23	1.75	2.12	2.20	2.23					
Viscosity @ 20°C (cSt)		2.51	3.07	3.35	2.51	3.14	3.27	3.35					
IBP		164	171	185	164	170	185	167					
T <sub>10</sub>		197	200	209	198	198	209	197					
T <sub>20</sub>		205	210	216	205	208	216	211					
T <sub>50</sub>		229	242	251	229	243	244	251					
T <sub>95</sub>	340 (max)	285	309	322	285	309	322	320					
FBP		307	325	332	307	331	331	332					
Calculated Cetane Index <small>4Variable</small>	46 (min)	46.9	48.1	50.3	50.3	47.3	47.7	46.9					
Cetane Number	51 (min)	52.2	53.3	53.9	53.9	52.2	53.7	53.5					

Specification combines EN590 Arctic Grade 2 with higher cetane aspects of the Temperate Grades  
50mg/kg sulphur limit provides tax incentive versus EN590



# NORWAY - Key Trends



Contents



# POLAND

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30514/02	30515/02							
Cloud Point (°C)		-12	-11	-9	-12	-9							
Pour Point (°C)		-48	-42	-36	-48	-36							
CFPP (°C)	-20 (max)	-26	-24	-21	-21	-26							
HFRR (µm)	460 (max)	368	399	430	430	368							
Wax Content (wt%) at 10°C Below Cloud		1.7	1.7	1.7	1.7	1.7							
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	828.5	833.1	837.6	828.5	837.6							
Sulphur (mg/Kg)	350 (max)	21	37	53	53	21							
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.90	2.97	3.04	3.04	2.90							
Viscosity @ 20°C (cSt)		4.55	4.70	4.84	4.84	4.55							
IBP		169	180	191	191	169							
T <sub>10</sub>		216	220	223	223	216							
T <sub>20</sub>		231	234	237	237	231							
T <sub>50</sub>		276	277	278	278	276							
T <sub>95</sub>	360 (max)	339	342	344	339	344							
FBP		346	350	355	346	355							
Calculated Cetane Index <small>4Variable</small>	46 (min)	53.3	55.9	58.4	58.4	53.3							
Cetane Number	49 (min)	49.7	51.9	54.1	54.1	49.7							



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# POLAND - Key Trends



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# PORTUGAL

## National standards and physical inspection data

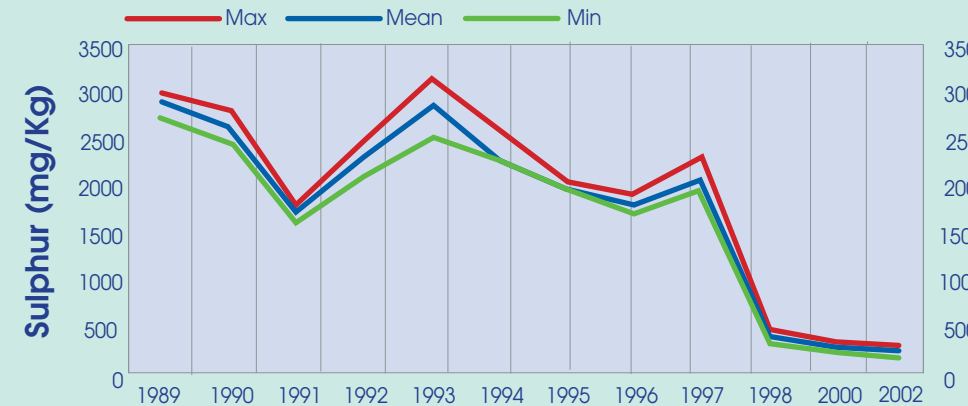
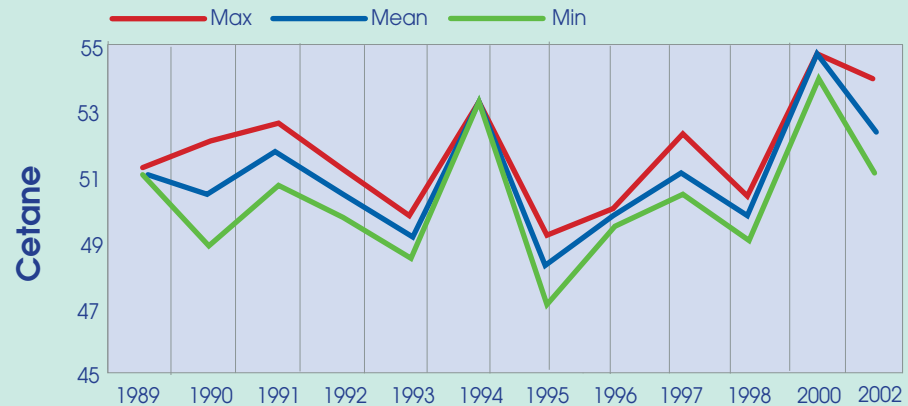
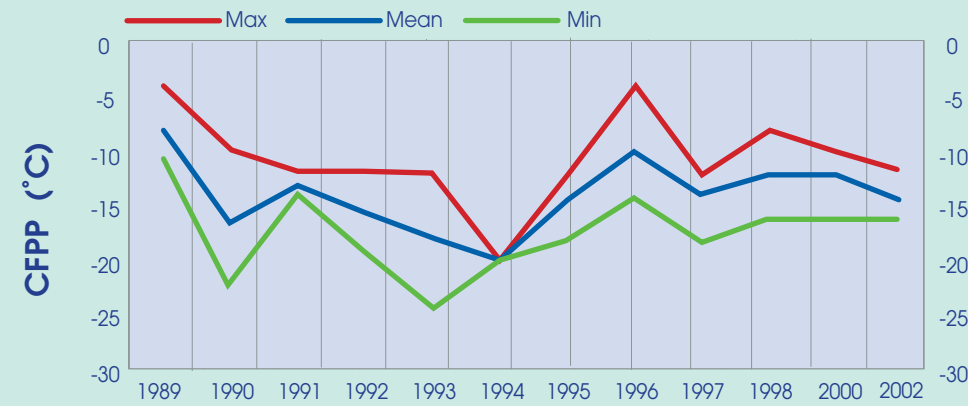
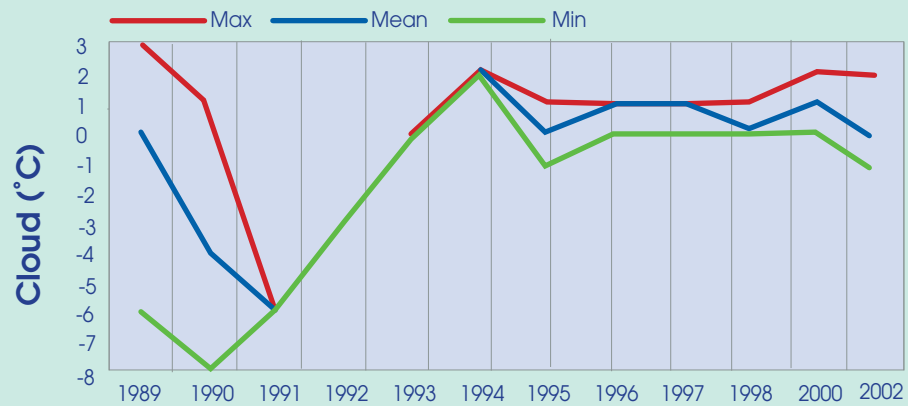
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30428/02	30429/02	30437/02						
Cloud Point (°C)		-1	0	2	-1	-1	2						
Pour Point (°C)		-18	-18	-18	-18	-18	-18						
CFPP (°C)	-10 (max)	-16	-14	-11	-14	-16	-11						
HFRR (µm)	460 (max)	435	448	459	435	459	449						
Wax Content (wt%) at 10°C Below Cloud		1.5	1.9	2.1	2.1	1.5	2.1						
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	833.8	839.2	842.0	841.8	833.8	842.0						
Sulphur (mg/Kg)	350 (max)	220	279	308	308	220	308						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.62	2.85	2.97	2.97	2.62	2.96						
Viscosity @ 20°C (cSt)		4.04	4.48	4.70	4.70	4.04	4.69						
IBP		174	178	184	184	174	176						
T <sub>10</sub>		200	210	217	217	200	213						
T <sub>20</sub>		216	225	231	231	216	227						
T <sub>50</sub>		265	271	273	273	265	273						
T <sub>95</sub>	360 (max)	360	361	363	360	363	360						
FBP		371	374	378	372	378	371						
Calculated Cetane Index <small>4Variable</small>	46 (min)	51.0	51.4	51.7	51.4	51.7	51.0						
Cetane Number	51 (min)	51.5	52.7	54.1	52.5	54.1	51.5						



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# PORTUGAL - Key Trends



Contents



# ROMANIA

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					31410/02	31411/02	31412/02						
Cloud Point (°C)		-7	-6	-5	-7	-5	-6						
Pour Point (°C)		-27	-24	-21	-27	-21	N/A						
CFPP (°C)		-14	-12	-10	-10	-14	N/A						
HFRR (µm)		376	464	556	376	556	460						
Wax Content (wt%) at 10°C Below Cloud		0.8	1.8	2.7	0.8	2.7	1.8						
Density (kg/m <sup>3</sup> @ 15°C)	850 (max)	828.9	839.2	849.1	849.1	828.9	839.7						
Sulphur (mg/Kg)	3000 (max)	252	946	1620	966	252	1620						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.21	2.58	3.02	3.02	2.21	2.51						
Viscosity @ 20°C (cSt)		3.37	4.06	4.93	4.93	3.37	3.89						
IBP		173	178	181	173	181	181						
T <sub>10</sub>		207	211	214	214	207	212						
T <sub>20</sub>		215	222	227	227	215	223						
T <sub>50</sub>		253	262	272	272	253	260						
T <sub>95</sub>		339	352	371	371	339	346						
FBP		350	363	382	382	350	358						
Calculated Cetane Index <small>4Variable</small>		48.2	49.7	51.5	48.2	51.5	49.5						
Cetane Number		47.1	48.7	51.7	47.4	51.7	47.1						

N/A - Data not available

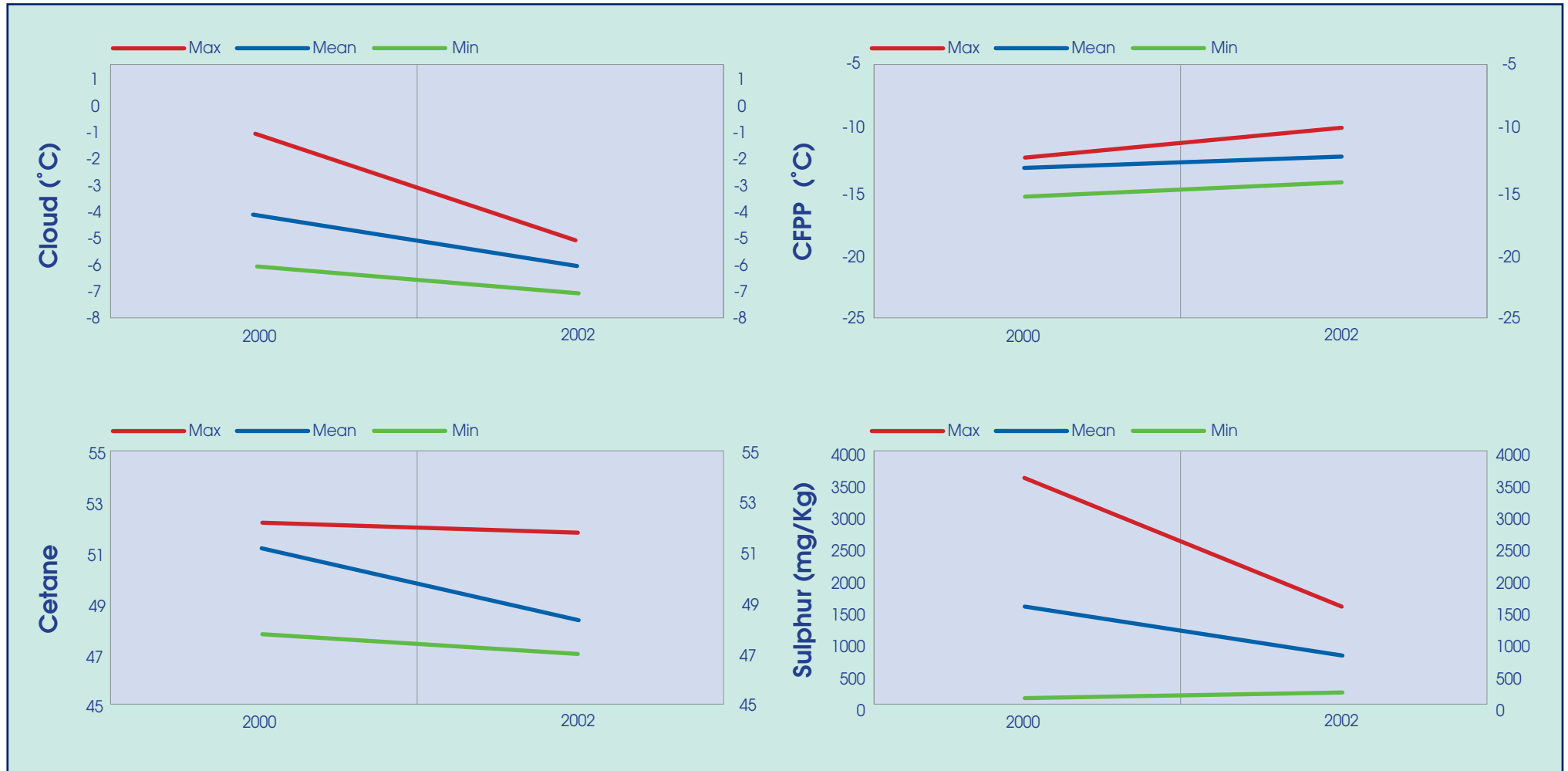


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# ROMANIA - Key Trends



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# SLOVAKIA

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30520/02								
Cloud Point (°C)			-10		-10								
Pour Point (°C)			-36		-36								
CFPP (°C)	-15 (max)		-28		-28								
HFRR (µm)	460 (max)		422		422								
Wax Content (wt%) at 10°C Below Cloud			1.5		1.5								
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845		839.6		839.6								
Sulphur (mg/Kg)	350 (max)		276		276								
Viscosity @ 40°C (cSt)	2.0 - 4.5		2.59		2.59								
Viscosity @ 20°C (cSt)			4.00		4.00								
IBP			179		179								
T <sub>10</sub>			211		211								
T <sub>20</sub>			220		220								
T <sub>50</sub>			260		260								
T <sub>95</sub>	360 (max)		340		340								
FBP			351		351								
Calculated Cetane Index <small>4Variable</small>	46 (min)		49.4		49.4								
Cetane Number	51 (min)		50.8		50.8								



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# SLOVAKIA - Key Trends



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# SPAIN - 1

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30423/02	30424/02	30425/02	30426/02	30427/02	30430/02	30431/02	30432/02	30433/02
Cloud Point (°C)		-7	-2	0	-1	-7	-1	-1	-3	0	-3	-4	-1
Pour Point (°C)		-24	-19	-12	-21	-21	-15	-12	-24	-15	-18	-24	-18
CFPP (°C)	-10 (max)	-21	-13	-7	-12	-21	-12	-11	-10	-13	-13	-14	-16
HFRR (µm)	460 (max)	301	397	428	428	423	415	403	301	395	376	398	393
Wax Content (wt%) at 10°C Below Cloud		1.0	1.8	2.4	2.3	1.0	2.1	2.4	1.6	2.2	1.5	1.7	1.9
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	829.2	838.4	843.8	829.2	830.8	843.4	841.7	843.8	838.1	841.2	834.5	839.6
Sulphur (mg/Kg)	350 (max)	227	291	324	324	321	233	316	265	289	303	227	299
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.40	2.72	3.00	2.76	2.60	3.00	2.93	2.78	2.88	2.55	2.41	2.81
Viscosity @ 20°C (cSt)		3.64	4.23	4.77	4.29	4.03	4.77	4.64	4.33	4.54	3.91	3.65	4.40
IBP		155	166	187	168	187	166	163	157	172	160	155	164
T <sub>10</sub>		187	205	219	205	219	214	200	201	212	198	187	209
T <sub>20</sub>		200	220	233	220	229	233	220	219	229	213	200	226
T <sub>50</sub>		260	269	276	272	263	275	274	269	276	263	266	273
T <sub>95</sub>	360 (max)	343	354	360	356	343	353	355	356	352	355	352	358
FBP		354	365	368	367	354	363	367	365	367	367	361	366
Calculated Cetane Index <small>4Variable</small>	46 (min)	48.3	51.1	55.4	55.4	54.1	50.7	50.2	48.7	52.8	48.3	50.7	51.6
Cetane Number	51 (min)	48.3	51.8	55.4	55.4	55.0	48.3	53.9	48.4	53.9	50.1	51.7	51.3



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# SPAIN - 2

## National standards and physical inspection data

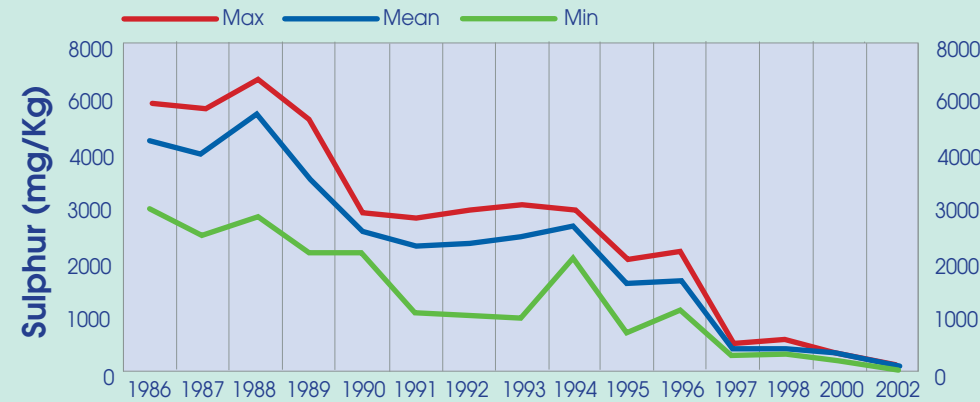
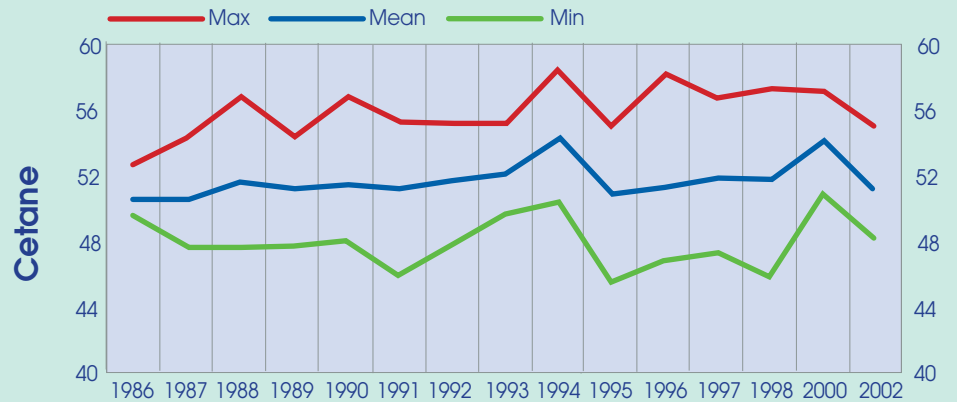
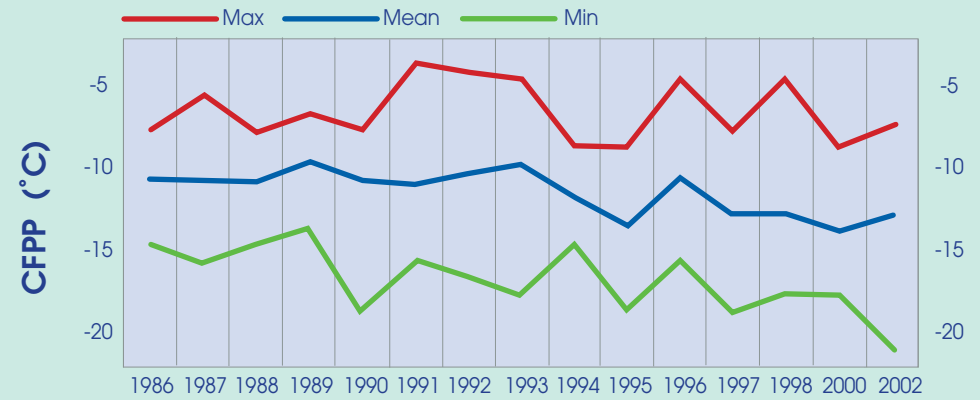
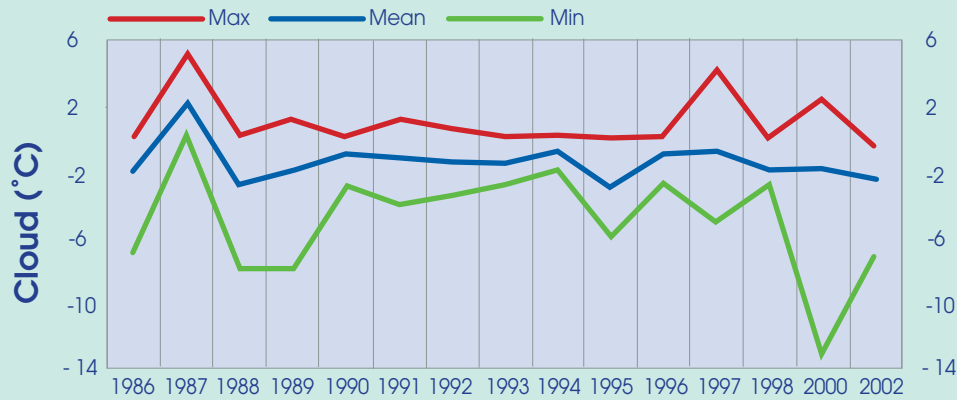
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30434/02	30435/02	30436/02						
Cloud Point (°C)		-7	-2	0	-1	-3	-1						
Pour Point (°C)		-24	-19	-12	-12	-18	-24						
CFPP (°C)	-10 (max)	-21	-13	-7	-7	-14	-18						
HFRR (µm)	460 (max)	301	397	428	384	426	425						
Wax Content (wt%) at 10°C Below Cloud		1.0	1.8	2.4	1.7	1.9	1.7						
Density (kg/m <sup>3</sup> @ 15°C)	820 - 845	829.2	838.4	843.8	842.1	836.7	839.6						
Sulphur (mg/Kg)	350 (max)	227	291	324	302	314	304						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.40	2.72	3.00	2.65	2.40	2.81						
Viscosity @ 20°C (cSt)		3.64	4.23	4.77	4.11	3.64	4.41						
IBP		155	166	187	166	169	168						
T <sub>10</sub>		187	205	219	204	199	209						
T <sub>20</sub>		200	220	233	217	209	226						
T <sub>50</sub>		260	269	276	266	260	274						
T <sub>95</sub>	360 (max)	343	354	360	357	360	356						
FBP		354	365	368	365	368	367						
Calculated Cetane Index <small>4Variable</small>	46 (min)	48.3	51.1	55.4	48.9	49.6	51.6						
Cetane Number	51 (min)	48.3	51.8	55.4	51.5	49.5	52.9						



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# SPAIN - Key Trends



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# SWEDEN

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					31563/02	31564/02	31565/02	31566/02	31567/02	31568/02	31569/02		
Cloud Point (°C)	-16 (max)	-37	-33	-28	-28	-35	-37	-36	-30	-35	-29		
Pour Point (°C)		-42	-38	-33	-33	-36	-39	-39	-33	-42	-42		
CFPP (°C)	-26 (max)	-38	-37	-36	-36	-36	-38	-38	-38	-37	-36		
HFRR (µm)	460 (max)	321	359	411	346	321	357	368	349	411	359		
Wax Content (wt%) at 10°C Below Cloud		4.0	4.5	5.2	5.0	5.2	4.2	4.2	5.0	4.2	4.0		
Density (kg/m <sup>3</sup> @ 15°C)	800 - 820	812.3	813.8	815.9	812.3	814.1	813.4	815.0	813.4	815.9	812.7		
Sulphur (mg/Kg)	10 (max)	5	5	6	6	5	5	5	5	5	5		
Viscosity @ 40°C (cSt)		1.87	1.95	2.00	1.96	1.95	1.87	1.90	1.96	2.00	1.99		
Viscosity @ 20°C (cSt)		2.71	2.81	2.94	2.83	2.83	2.71	2.72	2.84	2.94	2.82		
IBP	180 (min)	178	187	194	191	194	178	190	183	188	183		
T <sub>10</sub>		201	208	213	209	211	201	205	206	213	211		
T <sub>20</sub>		208	214	219	216	217	208	210	214	219	219		
T <sub>50</sub>		229	233	236	234	234	229	229	234	236	235		
T <sub>95</sub>	285 (max)	277	279	282	282	278	280	278	277	277	280		
FBP		288	292	298	298	291	294	291	291	288	295		
Calculated Cetane Index <small>4Variable</small>	50 (min)	50.9	52.6	54.0	53.8	53.2	51.3	50.9	53.0	52.2	54.0		
Cetane Number	51 (min)	50.1	53.2	54.8	53.7	54.5	54.2	53.7	54.8	50.1	51.5		

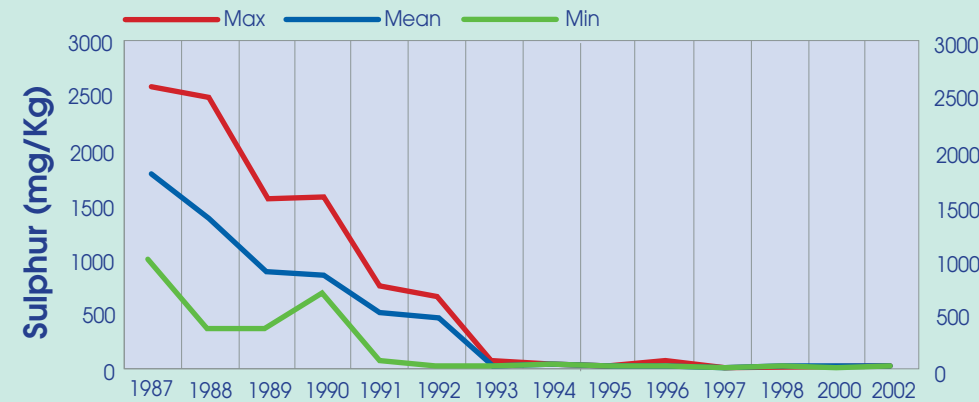
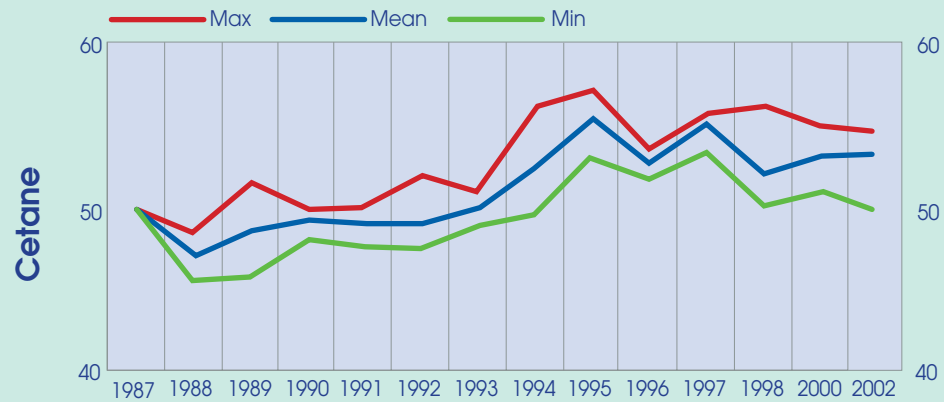
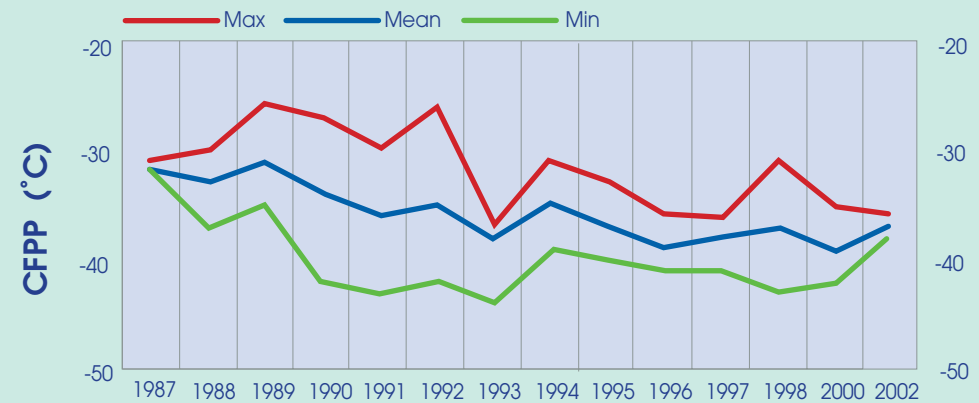
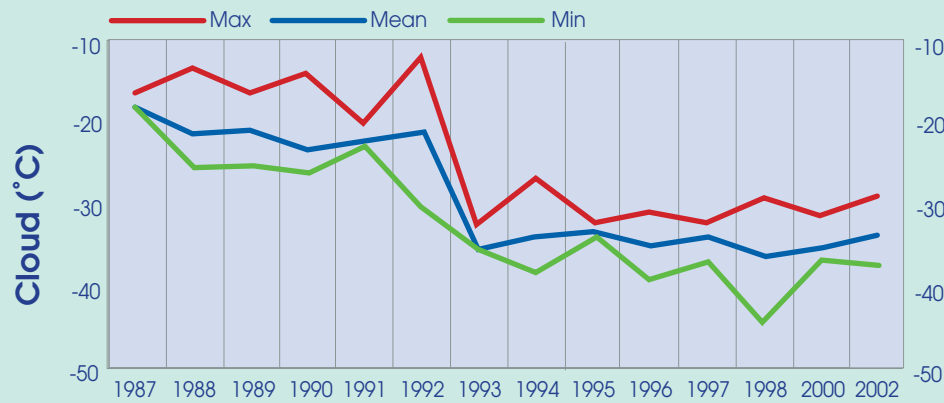
Specification shown is EC1 (Winter)  
Provides tax incentive versus EN590



Contents



# SWEDEN - Key Trends



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# SWITZERLAND

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30621/02	30622/02	30623/02	30624/02	30625/02				
Cloud Point (°C)	-10 (max)	-16	-13	-10	-11	-10	-14	-16	-12				
Pour Point (°C)		-45	-34	-24	-39	-39	-45	-24	-24				
CFPP (°C)	-20 (max)	-28	-22	-18	-20	-20	-18	-28	-22				
HFRR (µm)	460 (max)	306	413	513	429	384	513	432	306				
Wax Content (wt%) at 10°C Below Cloud		1.5	1.9	2.4	2.4	2.4	1.6	1.8	1.5				
Density (kg/m <sup>3</sup> @ 15°C)	800 - 845	823.1	830.1	836.7	828.0	834.0	823.1	828.6	836.7				
Sulphur (mg/Kg)	350 (max)	100	199	265	100	159	241	265	232				
Viscosity @ 40°C (cSt)	1.5 - 4.0	2.16	2.34	2.56	2.24	2.45	2.16	2.32	2.56				
Viscosity @ 20°C (cSt)		3.22	3.55	3.94	3.34	3.73	3.22	3.50	3.94				
IBP		150	162	171	167	171	166	150	157				
T <sub>10</sub>	180 (min)	198	204	212	198	199	200	212	212				
T <sub>20</sub>		207	216	224	209	216	207	223	224				
T <sub>50</sub>		241	254	263	252	260	241	256	263				
T <sub>95</sub>	340 (max)	320	332	340	330	333	338	320	340				
FBP		329	342	349	340	343	348	329	349				
Calculated Cetane Index <small>4Variable</small>	46 (min)	50.4	51.7	53.4	51.2	50.4	50.9	52.8	53.4				
Cetane Number	49 (min)	52.4	53.2	54.5	52.8	53.5	52.9	54.5	52.4				

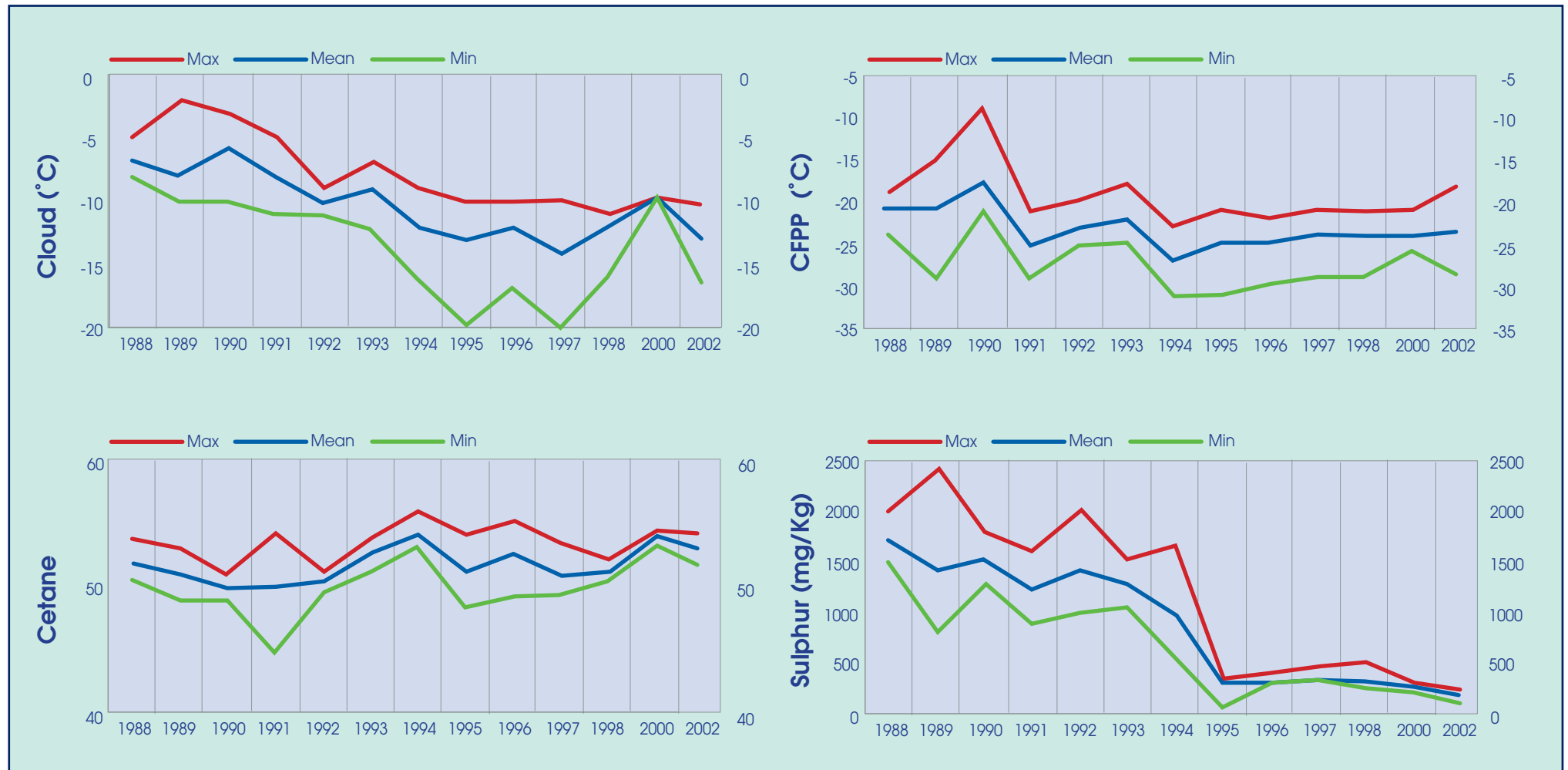
Specification shown is EN590 Arctic Grade 0



Contents



# SWITZERLAND - Key Trends



Contents



# UK - 1

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30502/02	30503/02	30504/02	30505/02	30518/02	30519/02	30150/02	30151/02	30152/02
Cloud Point (°C)		-20	-9	-6	-20	-9	-6	-10	-7	-6	-8	-6	-8
Pour Point (°C)		-33	-26	-18	-24	-27	-27	-27	-21	-27	-33	-27	-27
CFPP (°C)	-15 (max)	-26	-18	-14	-26	-19	-20	-17	-17	-15	-17	-14	-19
HFRR (µm)	460 (max)	284	377	468	468	367	284	386	377	375	352	429	333
Wax Content (wt%) at 10°C Below Cloud		1.1	2.1	2.7	2.6	1.8	1.9	2.7	2.1	1.8	2.4	2.5	2.1
Density (kg/m <sup>3</sup> @ 15°C)	820 - 835*	828.2	832.9	834.9	833.8	834.6	831.6	833.6	834.9	833.8	833.2	828.2	829.3
Sulphur (mg/Kg)	50 (max)*	7	42	55	37	47	7	47	39	47	37	55	46
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.33	2.56	2.82	2.33	2.47	2.78	2.73	2.70	2.35	2.69	2.53	2.44
Viscosity @ 20°C (cSt)		3.52	3.94	4.40	3.52	3.77	4.31	4.24	4.19	3.53	4.16	3.88	3.66
IBP		155	169	188	167	155	178	173	168	161	161	162	171
T <sub>10</sub>		198	207	221	208	200	209	217	212	201	207	198	204
T <sub>20</sub>		212	222	237	220	214	222	234	227	213	227	212	217
T <sub>50</sub>		252	266	275	258	264	271	272	268	252	272	266	262
T <sub>95</sub>	345 (max)*	320	340	346	320	343	345	339	342	341	335	344	342
FBP		328	350	363	328	351	352	346	355	353	346	353	351
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.2	52.7	54.8	50.5	51.0	54.5	54.4	52.7	49.2	53.8	54.1	53.3
Cetane Number	51 (min)	51.3	53.7	55.5	51.7	52.9	55.1	54.7	53.5	51.3	55.5	55.0	53.9

\* Specifications for Ultra Low Sulphur Diesel



Contents



# UK - 2

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30234/02	30565/02	30566/02						
Cloud Point (°C)		-20	-9	-6	-6	-10	-9						
Pour Point (°C)		-33	-26	-18	-18	-24	-24						
CFPP (°C)	-15 (max)	-26	-18	-14	-16	-19	-20						
HFRR (µm)	460 (max)	284	377	468	330	410	416						
Wax Content (wt%) at 10°C Below Cloud		1.1	2.1	2.7	2.0	1.1	2.0						
Density (kg/m <sup>3</sup> @ 15°C)	820 - 835*	828.2	832.9	834.9	834.7	833.1	833.6						
Sulphur (mg/Kg)	50 (max)*	7	42	55	51	44	43						
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.33	2.56	2.82	2.82	2.46	2.48						
Viscosity @ 20°C (cSt)		3.52	3.94	4.40	4.40	3.78	3.79						
IBP		155	169	188	188	177	172						
T <sub>10</sub>		198	207	221	221	206	205						
T <sub>20</sub>		212	222	237	237	221	221						
T <sub>50</sub>		252	266	275	275	264	264						
T <sub>95</sub>	345 (max)*	320	340	346	346	341	338						
FBP		328	350	363	363	355	351						
Calculated Cetane Index <small>4Variable</small>	46 (min)	49.2	52.7	54.8	54.8	52.1	52.0						
Cetane Number	51 (min)	51.3	53.7	55.5	55.2	52.9	53.2						

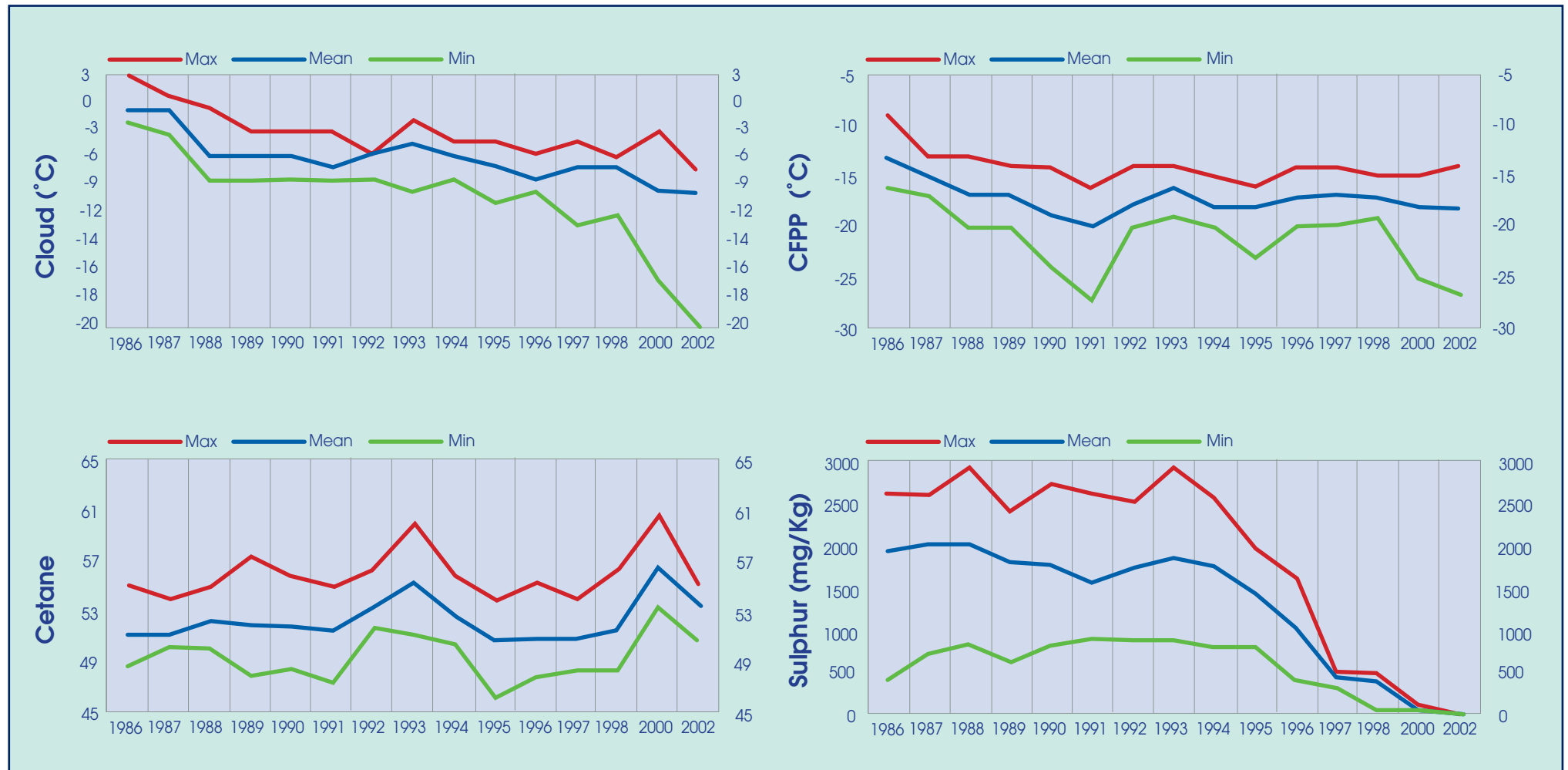
\* Specifications for Ultra Low Sulphur Diesel



Contents



# UK - Key Trends



Contents



# ASIA PACIFIC



# AUSTRALIA

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					Min	Mean	Max	31413/02	31414/02	31415/02	31416/02	31596/02	31597/02
Cloud Point (°C)		-5	-3	-1	-1	-2	-3	-2	-3	-3	-5	-1	
Pour Point (°C)		-12	-7	-3	-9	-3	-9	-6	-6	-6	-12	-3	
CFPP (°C)		-7	-4	-2	-4	-5	-4	-4	-3	-5	-7	-2	
HFRR (µm)	**	360	400	510	373	364	380	374	360	472	510	366	
Wax Content (wt%) at 10°C Below Cloud		2.5	4.9	7.3	4.7	7.3	3.3	6.1	5.4	6.4	2.5	3.7	
Density (kg/m <sup>3</sup> @ 15°C)	820 - 860	827.2	847.0	858.1	833.4	849.6	856.8	851.0	845.1	854.7	827.2	858.1	
Sulphur (mg/Kg)	Various*	288	622	1430	812	632	384	1430	288	628	455	349	
Viscosity @ 40°C (cSt)	2.0 - 4.5	2.63	2.97	3.42	2.71	3.26	3.42	3.04	2.65	2.89	2.63	3.15	
Viscosity @ 20°C (cSt)		4.06	4.65	5.38	4.06	5.18	5.38	4.93	4.07	4.61	4.06	4.90	
IBP		161	188	222	187	222	161	208	164	194	185	184	
T <sub>10</sub>		218	229	248	228	248	218	242	219	228	219	230	
T <sub>20</sub>		231	242	257	241	257	239	252	233	245	231	239	
T <sub>50</sub>		264	271	280	266	279	280	275	267	273	264	265	
T <sub>95</sub>	371(max)	329	338	347	332	345	345	341	335	329	347	332	
FBP		343	352	363	346	363	359	354	343	344	357	346	
Calculated Cetane Index <small>4Variable</small>	46 (min)	45.9	49.8	55.8	54.2	52.0	46.3	48.7	49.0	46.5	55.8	45.9	
Cetane Number		46.9	52.8	59.1	56.5	56.6	46.9	51.7	50.8	50.4	59.1	50.1	

\* 500 mg/Kg for Qld and W Australia, 1300mg/Kg for S Australia and 5000mg/kg for rest of Australia, all Australia 500mg/kg from 1/1/03

\*\* HFRR performance specification 460µm from 16/10/02 for all diesel containing less than 500mg/kg of sulphur



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# AUSTRALIA - Key Trends



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## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
Cloud Point (°C)		-	-	-									
Solid Point (°C)	0 (max)	-12	-4	0									
CFPP (°C)	4 (max)	-10	-2	4									
HFRR (µm)		-	-	-									
Wax Content (wt%) at 10°C Below Cloud		-	-	-									
Density (kg/m <sup>3</sup> @ 15°C)		-	-	-									
Sulphur (mg/Kg)	2000	50	1200	3800									
Viscosity @ 40°C (cSt)	-	-	-	-									
Viscosity @ 20°C (cSt)	3.0 - 8.0	3.98	4.64	5.28									
IBP		-	-	-									
T <sub>50</sub>	300 (max)	252	269	286									
T <sub>90</sub>	355 (max)	316	339	352									
T <sub>95</sub>	365 (max)	330	345	348									
FBP		-	-	-									
Calculated Cetane Index <small>4Variable</small>		-	-	-									
Cetane Number	45 (min)	45.0	48.0	53.0									

NB: All data supplied by SINOPEC



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number									
Cloud Point (°C)		-	-	-										
Solid Point (°C)	-20 (max)	-22	-21	-20										
CFPP (°C)	-14 (max)	-17	-15	-14										
HFRR (µm)		-	-	-										
Wax Content (wt%) at 10°C Below Cloud		-	-	-										
Density (kg/m <sup>3</sup> @ 15°C)		-	-	-										
Sulphur (mg/Kg)	2000	200	1000	1800										
Viscosity @ 40°C (cSt)	-	-	-	-										
Viscosity @ 20°C (cSt)	2.5 - 8.0	3.80	4.60	4.92										
IBP		-	-	-										
T <sub>50</sub>	300 (max)	252	267	286										
T <sub>90</sub>	355 (max)	316	329	345										
T <sub>95</sub>	365 (max)	319	345	358										
FBP		-	-	-										
Calculated Cetane Index <small>4Variable</small>		-	-	-										
Cetane Number	45 (min)	46.0	51.0	55.0										

NB: All data supplied by SINOPEC



Contents



### National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number									
Cloud Point (°C)		-	-	-										
Solid Point (°C)	-35 (max)	-46	-39	-35										
CFPP (°C)	-29 (max)	-45	-34	-29										
HFRR (µm)		-	-	-										
Wax Content (wt%) at 10°C Below Cloud		-	-	-										
Density (kg/m <sup>3</sup> @ 15°C)		-	-	-										
Sulphur (mg/Kg)	2000	30	200	320										
Viscosity @ 40°C (cSt)	-	-	-	-										
Viscosity @ 20°C (cSt)	1.8 - 7.0	1.82	2.21	3.15										
IBP		-	-	-										
T <sub>50</sub>	300 (max)	201	214	262										
T <sub>90</sub>	355 (max)	232	260	293										
T <sub>95</sub>	365 (max)	249	285	316										
FBP		-	-	-										
Calculated Cetane Index <small>4Variable</small>		-	-	-										
Cetane Number	45 (min)	45.0	48.0	59.0										

NB: All data supplied by SINOPEC



Contents



### National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number									
Cloud Point (°C)		-	-	-										
Solid Point (°C)	-10 (max)	-18	-12	-10										
CFPP (°C)	-5 (max)	-12	-7	-5										
HFRR (µm)		-	-	-										
Wax Content (wt%) at 10°C Below Cloud		-	-	-										
Density (kg/m <sup>3</sup> @ 15°C)		-	-	-										
Sulphur (mg/Kg)	2000	500	1000	1900										
Viscosity @ 40°C (cSt)	-	-	-	-										
Viscosity @ 20°C (cSt)	3.0 - 8.0	3.50	4.10	4.50										
IBP		-	-	-										
T <sub>50</sub>	300 (max)	256	268	278										
T <sub>90</sub>	355 (max)	304	309	318										
T <sub>95</sub>	365 (max)	315	319	329										
FBP		-	-	-										
Calculated Cetane Index <sub>4Variable</sub>		-	-	-										
Cetane Number	45 (min)	46.0	51.0	56.0										

NB: All data supplied by SINOPEC



Contents



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					3	4	5	6	7	9	10	11	12
Cloud Point (°C)		-10	-3	1	-3	-5	-2	-10	-5	-8	-1	-5	-4
Pour Point (°C)	-7.5 (max)*	<-40.0	-21.0	-12.5	-27.5	-15.0	-17.5	-27.5	-22.5	-15.0	-17.5	-17.5	-22.5
CFPP (°C)	-5 (max)	-15	-9	-4	-15	-11	-5	-15	-14	-12	-9	-8	-13
HFRR (µm)		263	401	506	358	349	420	326	318	498	506	495	485
Wax Content (wt%) at 10°C Below Cloud		0.0	2.5	4.6	2.1	1.6	3.7	0.0	1.1	0.7	2.2	2.3	2.0
Density (kg/m <sup>3</sup> @ 15°C)		827.0	836.2	847.0	833.0	834.0	835.0	833.0	827.0	831.0	830.0	827.0	828.0
Sulphur (mg/Kg)	500 (max)	150	353	460	460	150	340	280	320	320	450	440	300
Viscosity @ 30°C (cSt)	2.5 (min)	3.19	3.93	4.76	3.29	4.03	4.11	3.19	3.23	3.58	3.42	3.37	3.44
IBP		142	168	191	167	164	-	-	167	170	159	164	-
T <sub>10</sub>		181	215	248	194	224	225	199	199	212	190	199	181
T <sub>20</sub>		210	237	263	215	247	247	219	220	236	212	224	210
T <sub>50</sub>		272	286	297	274	282	290	272	272	282	279	282	287
T <sub>90</sub>	350 (max)	327	339	348	340	339	338	327	335	331	348	332	339
FBP		355	366	381	366	369	364	359	365	359	381	355	364
Calculated Cetane Index <sub>4Variable</sub>		51.1	55.8	57.9	53.3	56.7	57.9	53.1	55.9	57.1	55.1	57.9	57.2
Cetane Number	45 (min)	47.7	55.0	61.6	47.9	54.4	53.7	54.4	52.5	54.3	60.6	60.9	53.8

\* Pour point measured at 2.5°C intervals (Japanese Industry Standard)



Contents



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					13	14	15	16	17	18	19	20	21
Cloud Point (°C)		-10	-3	1	-1	-2	-2	-2	-3	-2	-3	-2	-2
Pour Point (°C)	-7.5 (max)*	<-40.0	-21.0	-12.5	-40.0	-15.0	-15.0	<-40.0	-30.0	-40.0	-20.0	-17.5	-15.0
CFPP (°C)	-5 (max)	-15	-9	-4	-5	-8	-7	-6	-6	-7	-5	-12	-11
HFRR (µm)		263	401	506	386	383	455	461	489	366	461	263	409
Wax Content (wt%) at 10°C Below Cloud		0.0	2.5	4.6	3.7	2.6	3.3	3.1	2.2	2.8	2.6	2.9	2.9
Density (kg/m <sup>3</sup> @ 15°C)		827.0	836.2	847.0	844.0	841.0	838.0	835.0	834.0	847.0	837.0	837.0	837.0
Sulphur (mg/Kg)	500 (max)	150	353	460	420	400	320	450	240	440	420	440	270
Viscosity @ 30°C (cSt)	2.5 (min)	3.19	3.93	4.76	4.46	4.69	4.37	3.99	3.65	3.96	4.08	3.79	3.95
IBP		142	168	191	-	142	191	163	-	-	-	164	177
T <sub>10</sub>		181	215	248	247	224	239	210	207	218	211	200	217
T <sub>20</sub>		210	237	263	259	244	256	239	230	239	240	227	240
T <sub>50</sub>		272	286	297	288	295	290	291	284	286	291	286	286
T <sub>90</sub>	350 (max)	327	339	348	341	346	337	340	340	340	342	343	339
FBP		355	366	381	367	372	363	362	365	362	364	369	370
Calculated Cetane Index <sub>4Variable</sub>		51.1	55.8	57.9	55.9	55.8	57.9	56.6	55.6	51.1	55.9	54.1	55.5
Cetane Number	45 (min)	47.7	55.0	61.6	54.7	54.5	61.6	47.7	54.4	58.0	53.9	57.7	60.6

\* Pour point measured at 2.5°C intervals (Japanese Industry Standard)



Contents



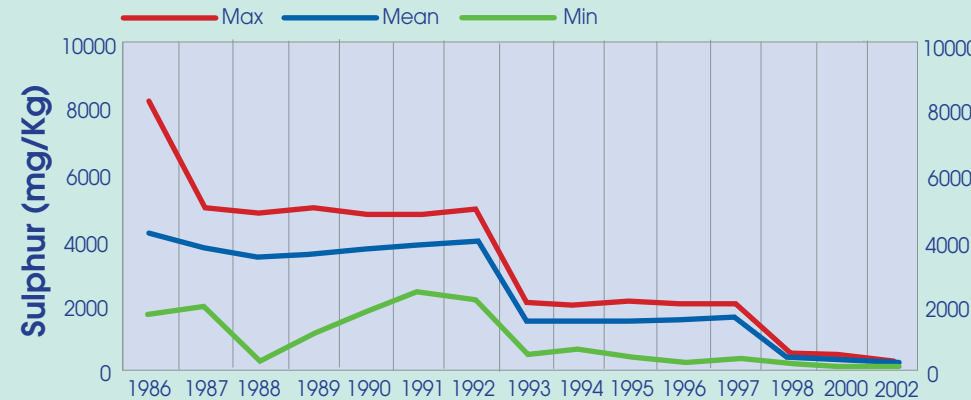
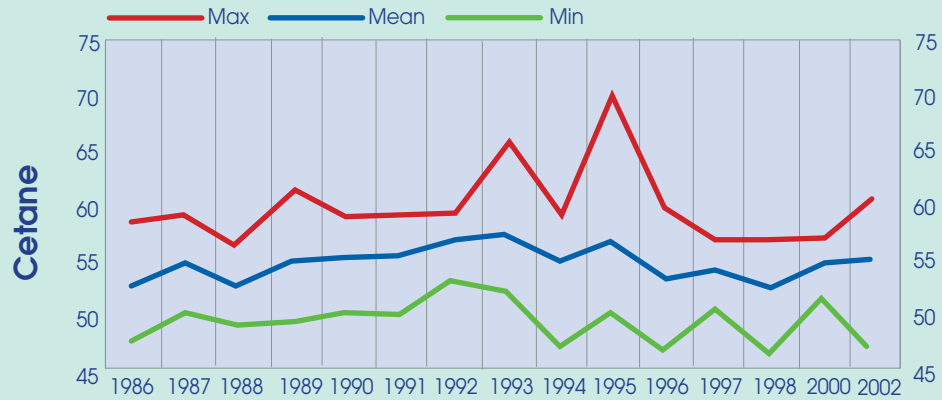
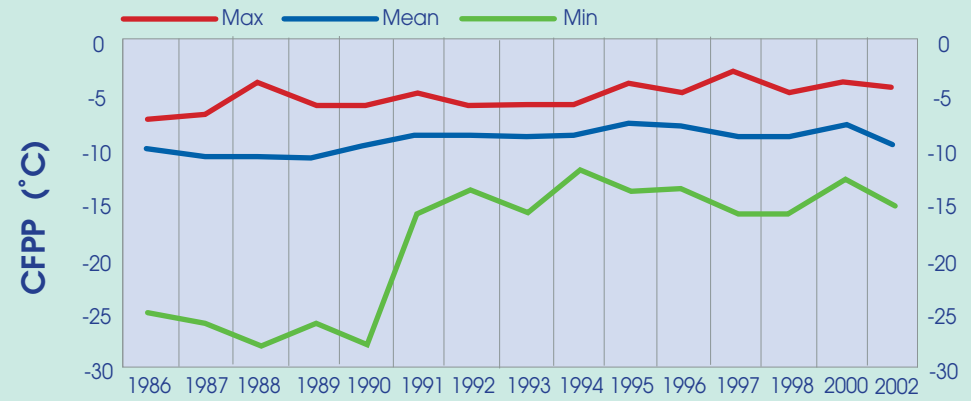
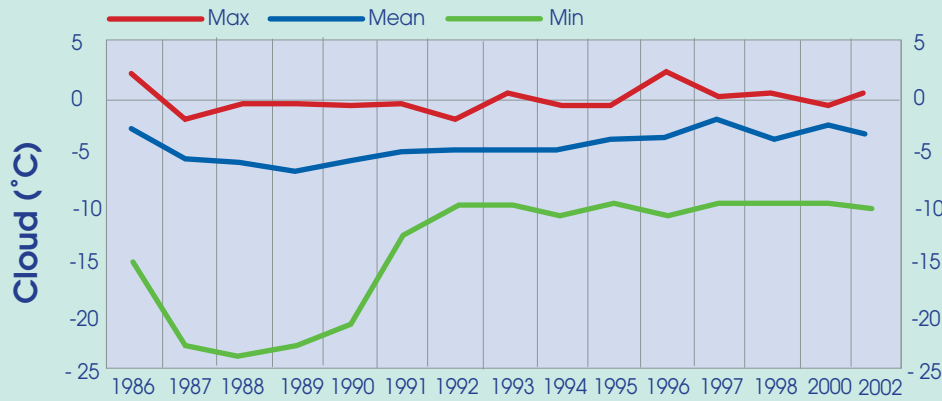
## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					22	23	24	25	26				
Cloud Point (°C)		-10	-3	1	-3	-1	1	1	-4				
Pour Point (°C)	-7.5 (max)*	<-40.0	-21.0	-12.5	-27.5	-12.5	-12.5	-17.5	-17.5				
CFPP (°C)	-5 (max)	-15	-9	-4	-15	-9	-9	-4	-8				
HFRR (µm)		263	401	506	326	367	390	334	381				
Wax Content (wt%) at 10°C Below Cloud		0.0	2.5	4.6	2.2	3.3	3.6	4.6	2.2				
Density (kg/m <sup>3</sup> @ 15°C)		827.0	836.2	847.0	839.0	843.0	838.0	846.0	838.0				
Sulphur (mg/Kg)	500 (max)	150	353	460	300	440	310	340	260				
Viscosity @ 30°C (cSt)	2.5 (min)	3.19	3.93	4.76	4.13	4.16	4.26	4.76	4.45				
IBP		142	168	191	176	180	-	-	-				
T <sub>10</sub>		181	215	248	226	232	218	248	227				
T <sub>20</sub>		210	237	263	246	251	245	263	253				
T <sub>50</sub>		272	286	297	285	286	292	297	295				
T <sub>90</sub>	350 (max)	327	339	348	339	341	347	347	342				
FBP		355	366	381	365	371	373	372	365				
Calculated Cetane Index <small>4Variable</small>		51.1	55.8	57.9	55.2	54.4	56.2	56.4	57.5				
Cetane Number	45 (min)	47.7	55.0	61.6	51.6	52.9	55.8	54.8	55.3				

\* Pour point measured at 2.5°C intervals (Japanese Industry Standard)



# JAPAN Grade 2 - Key Trends



Contents





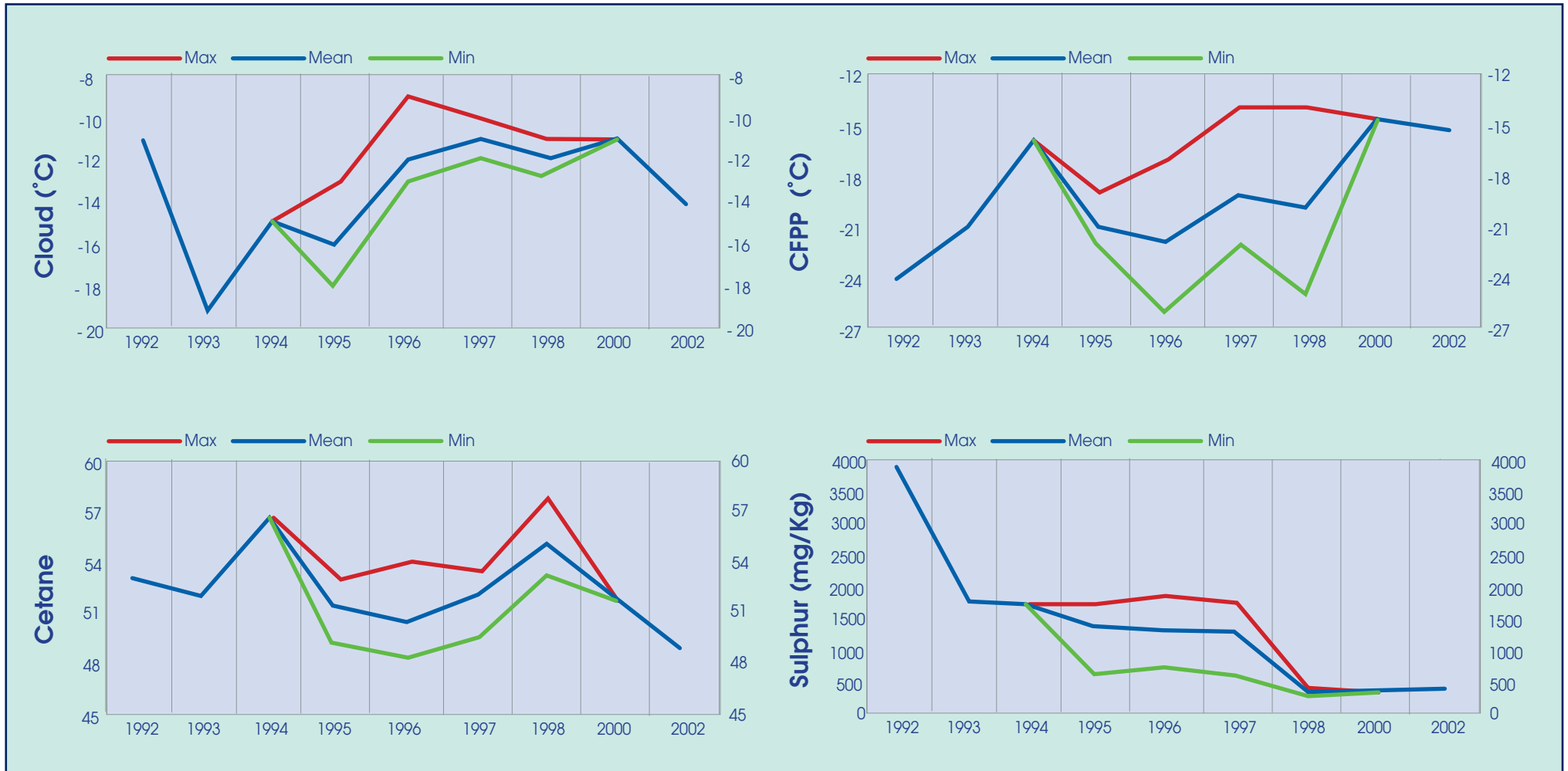
## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number									
					2									
Cloud Point (°C)			-14		-14									
Pour Point (°C)	-20 (max)*		-27.5		-27.5									
CFPP (°C)	-12 (max)		-15		-15									
HFRR (µm)			482		482									
Wax Content (wt%) at 10°C Below Cloud			1.9		1.9									
Density (kg/m <sup>3</sup> @ 15°C)			837.0		837.0									
Sulphur (mg/Kg)	500 (max)		460		460									
Viscosity @ 30°C (cSt)	2.0 (min)		3.16		3.16									
IBP			171		171									
T <sub>10</sub>			206		206									
T <sub>20</sub>			226		226									
T <sub>50</sub>			271		271									
T <sub>90</sub>	350 (max)		320		320									
FBP			350		350									
Calculated Cetane Index <small>4Variable</small>			51.6		51.6									
Cetane Number	45 (min)		49.1		49.1									

\* Pour point measured at 2.5°C intervals (Japanese Industry Standard)



# JAPAN Grade 3 - Key Trends



Contents



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					1	8							
Cloud Point (°C)		-18	-18	-17	-18	-17							
Pour Point (°C)	-30 (max)*	<-42.5	-37.5	-37.5	<-42.5	-37.5							
CFPP (°C)	-19 (max)	-36	-34	-31	-36	-31							
HFRR (µm)		491	493	494	491	494							
Wax Content (wt%) at 10°C Below Cloud		1.9	2.1	2.4	1.9	2.4							
Density (kg/m <sup>3</sup> @ 15°C)		808.0	812.0	816.0	808.0	816.0							
Sulphur M%	500 (max)	160	260	360	360	160							
Viscosity @ 30°C	1.7 (min)	1.87	2.15	2.42	1.87	2.42							
IBP		151	153	154	154	151							
T <sub>10</sub>		171	173	175	171	175							
T <sub>20</sub>		181	185	190	181	190							
T <sub>50</sub>		214	230	246	214	246							
T <sub>90</sub>	330 (max)	301	314	327	301	327							
FBP		322	340	357	322	357							
Calculated Cetane Index <sub>4Variable</sub>		48.2	50.7	53.2	48.2	53.2							
Cetane Number	45 (min)	47.6	51.0	54.3	47.6	54.3							

\* Pour point measured at 2.5°C intervals (Japanese Industry Standard)



Contents



# JAPAN Special Grade 3 - Key Trends



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# KOREA

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
Cloud Point (°C)		-10	-7	-6	-6	-6	-10	-8	-7				
Pour Point (°C)	-17.5 (max)	-35	-28	-20	-30	-20	-30	-25	-35				
CFPP (°C)	-16 (max)	-26	-23	-18	-23	-18	-26	-22	-24				
HFRR (µm)		317	380	455	455	450	321	356	317				
Wax Content (wt%) at 10°C Below Cloud		-	-	-	-	-	-	-	-				
Density (kg/m <sup>3</sup> @ 15°C)		820.0	831.6	842.0	834.0	833.0	842.0	820.0	829.0				
Sulphur (mg/Kg)	430 (max)	220	298	390	250	390	270	360	220				
Viscosity @ 40°C (cSt)	1.9 - 5.5	2.50	2.70	3.20	3.20	2.50	2.70	2.60	2.50				
Viscosity @ 20°C (cSt)		3.67	4.12	5.00	5.00	3.86	4.22	3.87	3.67				
IBP		130	154	179	167	130	179	135	157				
T <sub>10</sub>		172	199	220	210	220	210	172	185				
T <sub>20</sub>		201	222	243	234	243	228	201	203				
T <sub>50</sub>		267	275	283	283	280	275	272	267				
T <sub>90</sub>	360 (max)	329	336	339	339	339	329	338	337				
FBP		352	363	371	366	371	352	360	364				
Calculated Cetane Index <small>4Variable</small>	45 min	51.0	54.2	59.0	56.0	52.0	51.0	59.0	53.0				

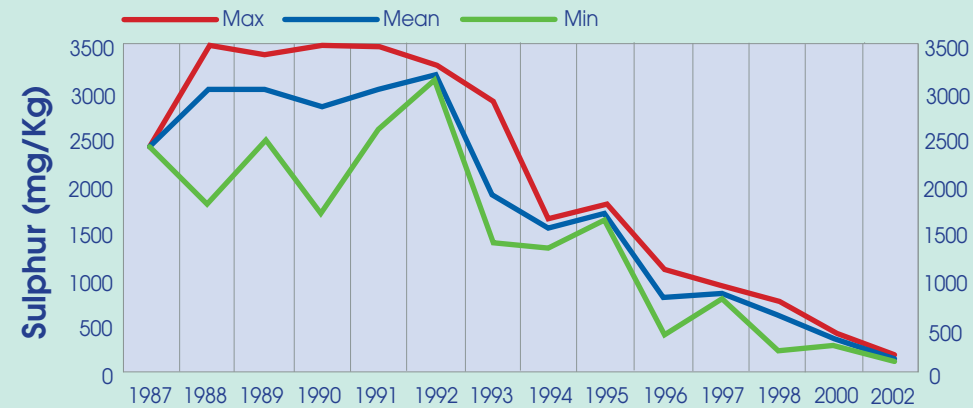
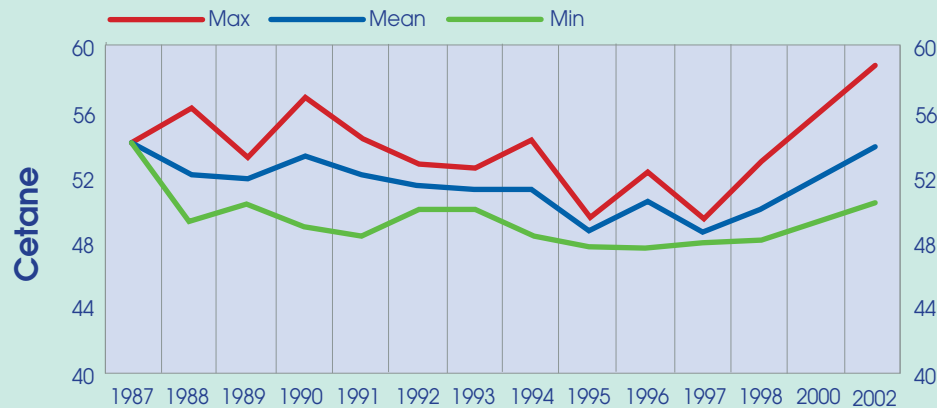
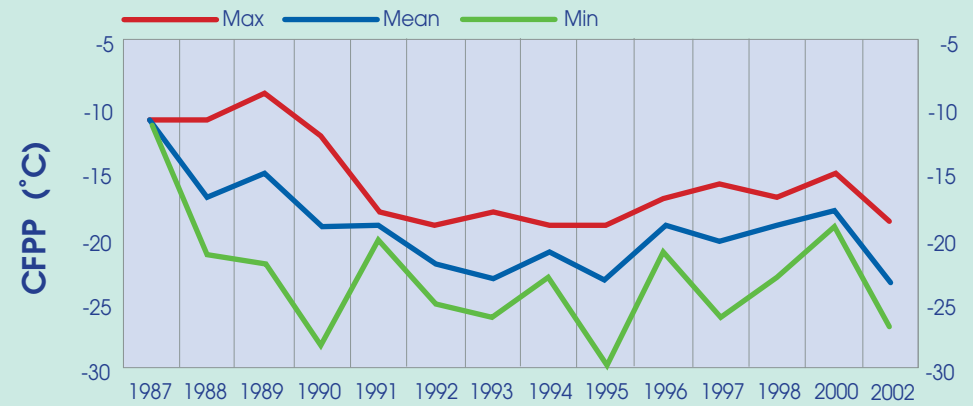
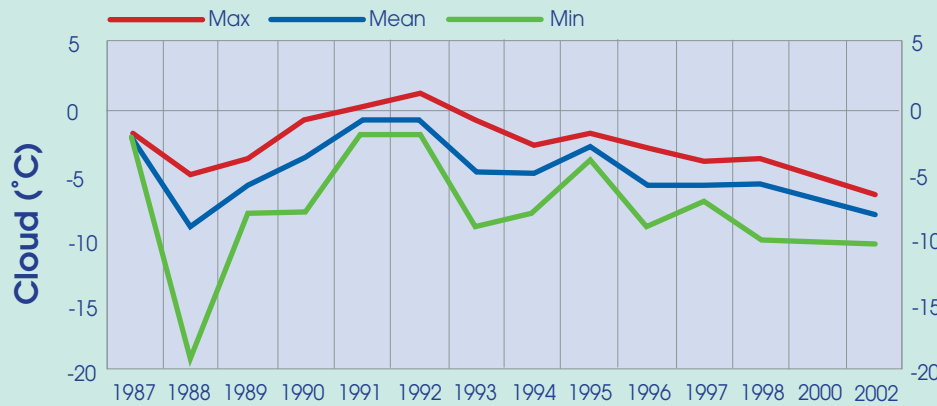
NB: Data supplied by KPQII



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# KOREA - Key Trends



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# MALAYSIA

## National standards and physical inspection data

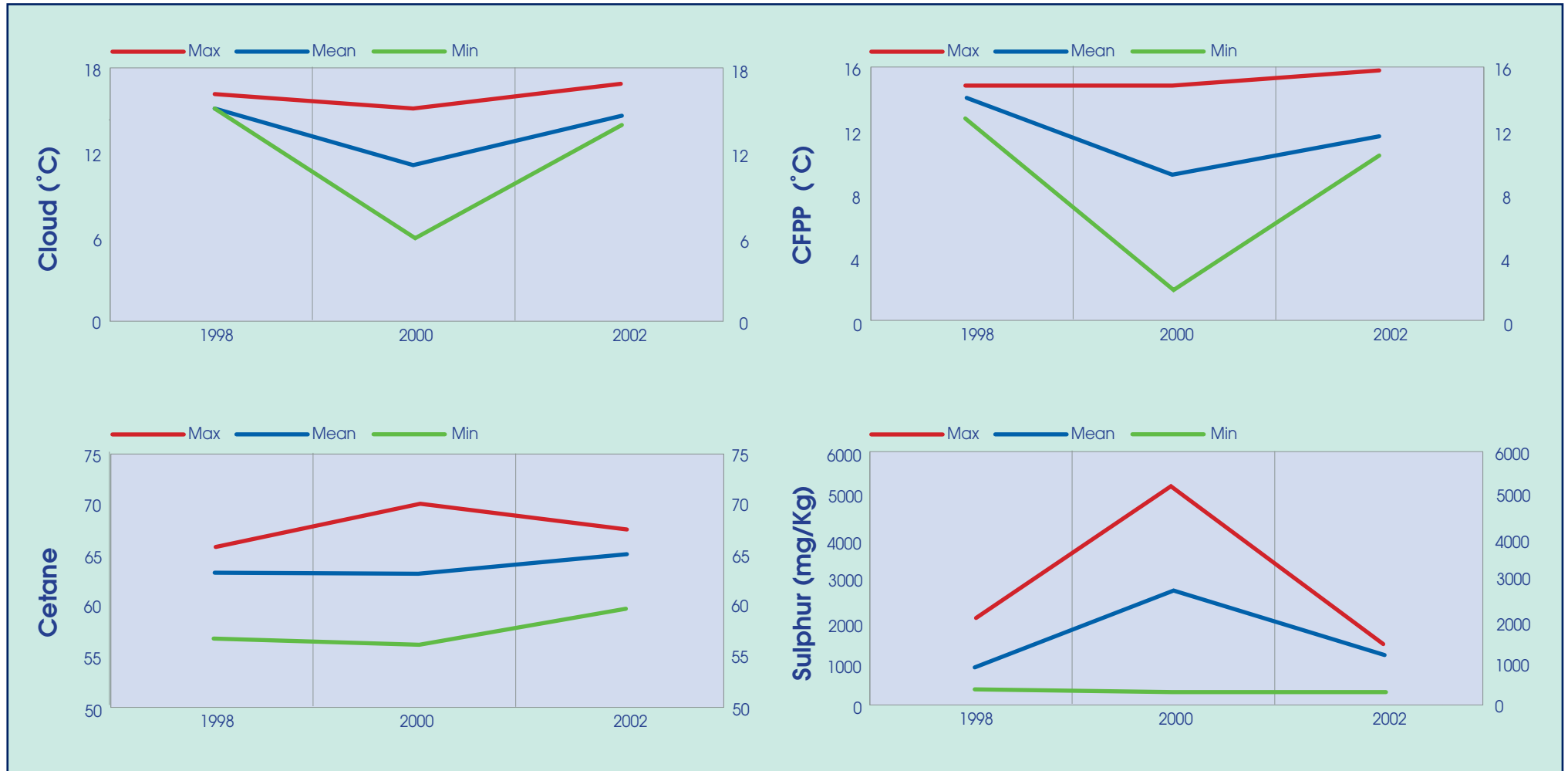
Infineum Sample No	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30459/02	30460/02	30461/02	30462/02	30463/02				
Cloud Point (°C)	18 (max)	15	16	17	15	15	16	15	17				
Pour Point (°C)	15 (max)	12	12	12	12	12	12	12	12				
CFPP (°C)		11	12	16	12	11	11	12	16				
HFRR (µm)		337	367	393	374	393	379	337	351				
Wax Content (wt%) at 10°C Below Cloud		2.3	4.6	5.9	5.9	5.0	4.0	5.6	2.3				
Density (kg/m <sup>3</sup> @ 15°C)		829.8	834.4	839.2	830.1	839.2	829.8	837.1	835.7				
Sulphur (mg/Kg)	5000 (max)	495	1048	1620	495	1320	910	893	1620				
Viscosity @ 40°C (cSt)	1.5 - 5.8	2.53	3.51	4.35	3.33	4.29	3.04	4.35	2.53				
Viscosity @ 20°C (cSt)		3.85	5.74	7.41	5.35	7.29	4.79	7.41	3.85				
IBP		181	204	227	191	218	203	227	181				
T <sub>10</sub>		214	238	260	230	256	230	260	214				
T <sub>20</sub>		226	251	272	248	270	241	272	226				
T <sub>50</sub>		254	283	301	286	301	273	301	254				
T <sub>90</sub>	370 (max)	345	354	358	357	358	352	358	345				
FBP		378	384	392	385	382	384	378	392				
Calculated Cetane Index <small>4Variable</small>		50.0	58.2	62.7	59.7	61.4	57.4	62.7	50.0				
Cetane Number	45 (min)	59.9	65.2	67.7	67.0	67.7	66.6	65.0	59.9				



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# MALAYSIA - Key Trends



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# SINGAPORE

## National standards and physical inspection data

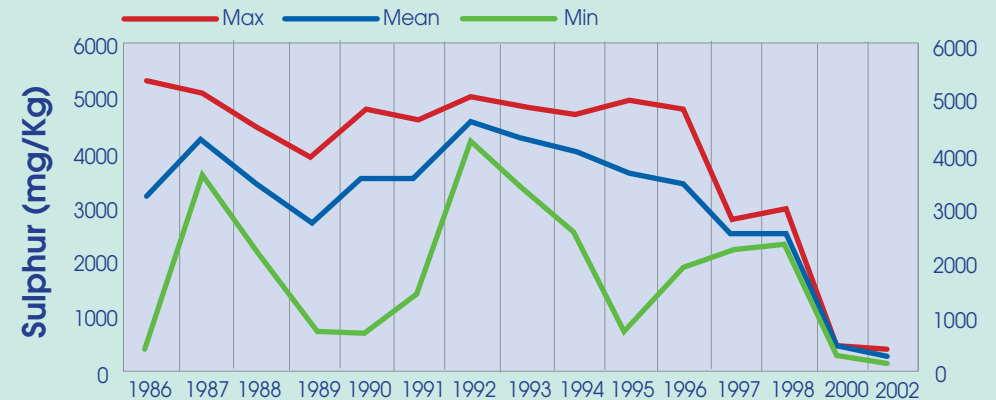
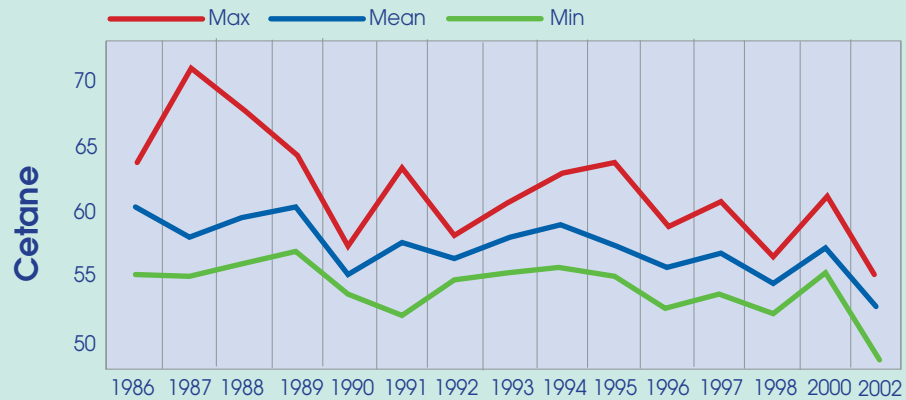
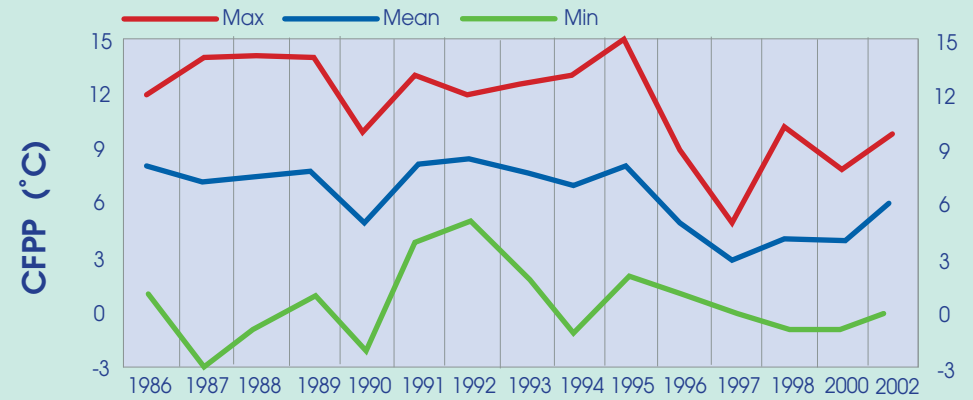
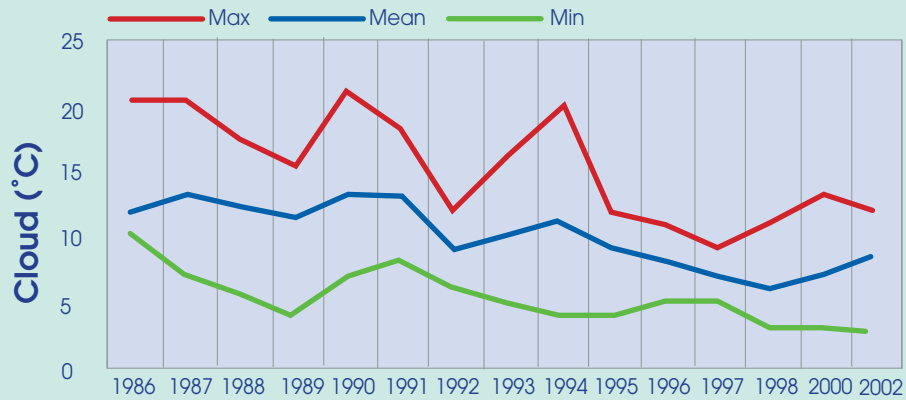
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30453/02	30454/02	30455/02	30456/02	30457/02	30458/02			
Cloud Point (°C)		3	9	12	12	3	8	9	8	11			
Pour Point (°C)		0	5	6	6	0	6	6	3	6			
CFPP (°C)		0	6	10	10	0	5	6	6	8			
HFRR (µm)		300	354	405	394	351	307	364	300	405			
Wax Content (wt%) at 10°C Below Cloud		2.1	2.4	2.8	2.7	2.8	2.2	2.3	2.1	2.5			
Density (kg/m <sup>3</sup> @ 15°C)	860 (max)	842.0	849.0	854.4	850.5	842.0	849.1	849.1	849.1	854.4			
Sulphur (mg/Kg)	500 (max)	283	342	457	457	289	287	298	283	439			
Viscosity @ 40°C (cSt)		3.83	4.29	4.64	4.64	3.83	4.14	4.49	4.14	4.48			
Viscosity @ 20°C (cSt)		6.44	7.26	8.12	8.12	6.44	7.10	7.12	7.04	7.74			
IBP		185	205	216	208	185	209	206	204	216			
T <sub>10</sub>		240	247	259	259	240	243	244	244	255			
T <sub>20</sub>		260	264	272	272	261	260	261	260	269			
T <sub>50</sub>		297	301	305	305	297	299	301	299	302			
T <sub>90</sub>	370 (max)	354	363	367	367	354	363	366	363	365			
FBP		372	384	389	379	372	387	389	386	389			
Calculated Cetane Index <small>4Variable</small>	48 (min)	54.6	55.8	57.5	57.2	57.5	55.0	55.3	55.1	54.6			
Cetane Number		48.0	52.9	55.0	52.7	53.9	53.9	55.0	53.6	48.0			



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# SINGAPORE - Key Trends



Contents



# THAILAND

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30447/02	30448/02	30449/02	30450/02	30451/02	30452/02			
Cloud Point (°C)	10	-9	5	12	6	12	-9	5	9	4			
Pour Point (°C)		-21	-2	6	3	6	-21	0	6	-3			
CFPP (°C)		-10	2	10	2	10	-10	2	7	3			
HFRR (µm)	460 (max)	-	-	-	-	-	-	-	-	-			
Wax Content (wt%) at 10°C Below Cloud		1.1	2.6	3.3	2.5	3.3	1.1	3.1	2.8	3.0			
Density (kg/m <sup>3</sup> @ 15°C)	810 - 870	821.5	838.7	849.3	834.8	846.5	821.5	837.5	849.3	842.4			
Sulphur (mg/Kg)	500 (max)	231	330	425	318	231	260	410	337	425			
Viscosity @ 40°C (cSt)	1.8 - 4.1	2.11	3.14	3.54	3.00	3.28	2.11	3.43	3.54	3.50			
Viscosity @ 20°C (cSt)		3.13	5.05	5.82	4.74	5.33	3.13	5.57	5.82	5.72			
IBP	357 (max)	173	179	192	179	192	178	177	173	175			
T <sub>10</sub>		201	218	229	210	229	201	216	224	227			
T <sub>20</sub>		207	235	249	225	242	207	238	247	249			
T <sub>50</sub>		238	277	291	279	280	238	289	284	291			
T <sub>90</sub>		322	348	360	356	360	322	352	351	349			
T <sub>90</sub>		322	348	360	356	360	322	352	351	349			
FBP		356	373	389	379	389	356	373	382	362			
Calculated Cetane Index <small>4Variable</small>	47 (min)	50.7	53.1	55.6	54.4	51.9	50.9	55.6	50.7	54.9			
Cetane Number	47 (min)	51.6	55.1	58.0	58.0	55.1	54.5	56.7	51.6	54.4			

HFRR data not available



Contents



# THAILAND - Key Trends



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# THE AMERICAS



# ARGENTINA - 1

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					31824/02	31825/02	31826/02	31827/02	31828/02	31829/02	31830/02	31831/02	31832/02
Cloud Point (°C)		-4	1	5	1	0	1	4	5	0	-4	2	4
Pour Point (°C)		-21	-15	-12	-15	-18	-15	-15	-15	-15	-18	-15	-12
CFPP (°C)		-14	-10	0	-14	-14	-13	-8	-7	-11	-11	-9	-11
HFRR (µm)		357	387	415	385	388	371	360	364	381	409	393	407
Wax Content (wt%) at 10°C Below Cloud		0.5	2.0	2.5	2.3	2.2	2.0	2.5	2.1	1.7	2.0	2.0	2.5
Density (kg/m <sup>3</sup> @ 15°C)		828.1	849.6	862.7	862.7	862.4	860.3	853.1	852.5	858.4	850.0	852.6	853.8
Sulphur (mg/Kg)		227	1107	1630	954	940	978	1140	1130	1020	227	1290	1280
Viscosity @ 40°C (cSt)		2.34	3.41	4.04	3.36	3.53	3.56	4.04	3.87	3.95	3.04	3.78	3.91
Viscosity @ 20°C (cSt)	1.81 - 5.83	3.54	5.72	8.80	5.87	8.80	5.57	6.14	6.17	6.52	4.93	6.35	6.50
IBP		144	165	186	170	182	181	170	165	169	157	177	186
T <sub>10</sub>		178	218	236	236	233	230	226	218	226	212	232	234
T <sub>20</sub>		198	237	254	250	248	245	240	244	245	234	252	254
T <sub>50</sub>		257	283	295	287	287	285	284	292	293	276	295	293
T <sub>90</sub>	360 (max)	336	352	363	349	347	350	348	355	362	336	363	352
FBP		367	378	385	373	373	376	373	376	385	367	382	376
Calculated Cetane Index <small>4Variable</small>		46.9	49.6	51.8	47.3	46.9	47.3	49.4	50.2	48.7	48.9	51.8	51.1
Cetane Number		48.3	51.0	52.3	51.7	51.6	51.2	50.0	51.7	48.3	50.9	51.4	52.3



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# ARGENTINA - 2

## National standards and physical inspection data

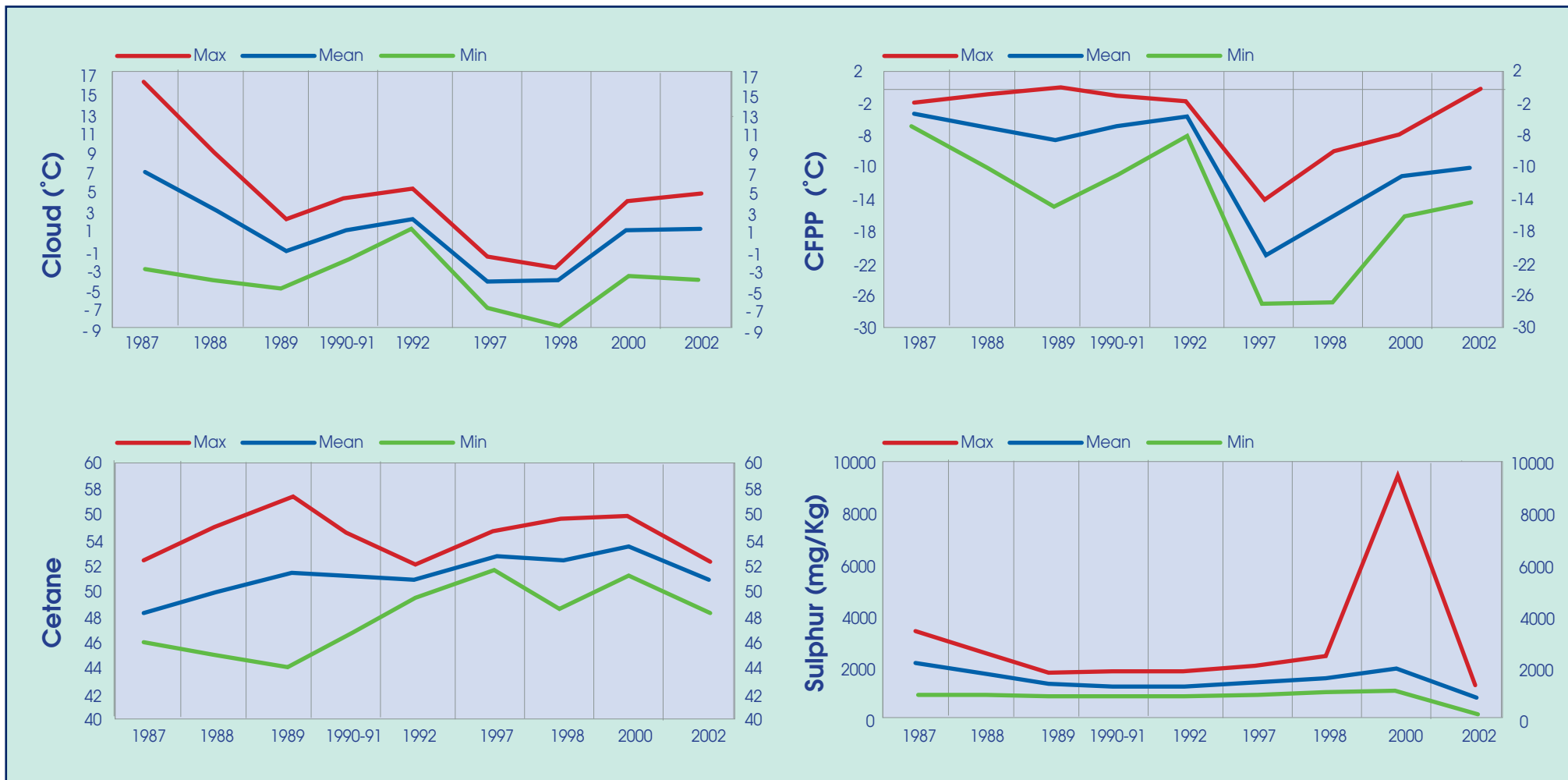
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					31833/02	31834/02	31835/02	31836/02					
Cloud Point (°C)		-4	1	5	2	1	1	-4					
Pour Point (°C)		-21	-15	-12	-15	-12	-15	-21					
CFPP (°C)		-14	-10	0	-11	0	-9	-7					
HFRR (µm)		357	387	415	357	393	412	415					
Wax Content (wt%) at 10°C Below Cloud		0.5	2.0	2.5	2.5	0.5	2.4	1.0					
Density (kg/m <sup>3</sup> @ 15°C)		828.1	849.6	862.7	848.2	828.1	832.4	830.6					
Sulphur (mg/Kg)		227	1107	1630	1170	1310	1320	1630					
Viscosity @ 40°C (cSt)		2.34	3.41	4.04	3.50	2.34	3.04	2.42					
Viscosity @ 20°C (cSt)	1.81 - 5.83	3.54	5.72	8.80	5.74	3.54	3.66	4.62					
IBP		144	165	186	147	144	149	150					
T <sub>10</sub>		178	218	236	218	178	204	184					
T <sub>20</sub>		198	237	254	243	198	225	202					
T <sub>50</sub>		257	283	295	291	257	279	261					
T <sub>90</sub>	360 (max)	336	352	363	356	349	356	349					
FBP		367	378	385	379	382	384	384					
Calculated Cetane Index <small>4Variable</small>		46.9	49.6	51.8	51.6	50.9	50.1	51.0					
Cetane Number		48.3	51.0	52.3	51.0	50.5	52.0	50.4					



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# ARGENTINA - Key Trends



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# BRAZIL

## National standards and physical inspection data

	Specification		Minimum observed	Mean value	Maximum observed	Sample number						
	Metropol. Areas	Other Regions				31491/02	31492/02	31493/02				
Cloud Point (°C)			3	7	10	8	10	3				
Pour Point°C			-18	-16	-12	-18	-18	-12				
CFPP (°C)			-7	-1	5	-7	5	-1				
HFRR (µm)			329	354	373	329	359	373				
Wax Content (wt%) at 10°C Below Cloud			1.1	1.1	1.1	1.1	1.1	1.1				
Density (kg/m <sup>3</sup> @ 15°C)	820-865	820-880	848.5	850.4	852.7	848.5	850	852.7				
Sulphur (mg/Kg)	2000 Max	3500Max	1400	1583	1710	1710	1400	1640				
Viscosity @ 40°C (cSt)	2.5 to 5.5	2.5 to 5.5	2.85	2.99	3.07	2.85	3.07	3.04				
Viscosity @ 20°C (cSt)			4.50	4.76	4.93	4.50	4.93	4.84				
IBP			128	135	140	136	128	140				
T <sub>10</sub>			180	186	193	180	186	193				
T <sub>20</sub>			200	209	215	200	211	215				
T <sub>50</sub>	310 Max	245 Max	270	272	274	270	273	274				
T <sub>95</sub>			393	397	402	402	397	393				
FBP			397	401	404	404	401	397				
Calculated Cetane Index <sub>4Variable</sub>	45 Min	45 Min	45.3	46.0	46.7	45.3	46.7	46.0				
Cetane Number	42 Min	42 Min	45.3	45.7	46.0	45.3	46.0	45.9				



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# BRAZIL - Key Trends



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# CANADA

## National standards and physical inspection data

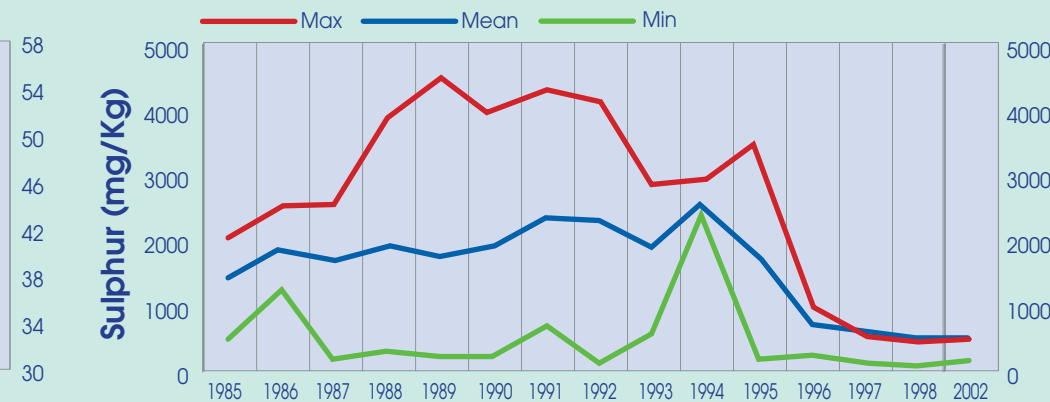
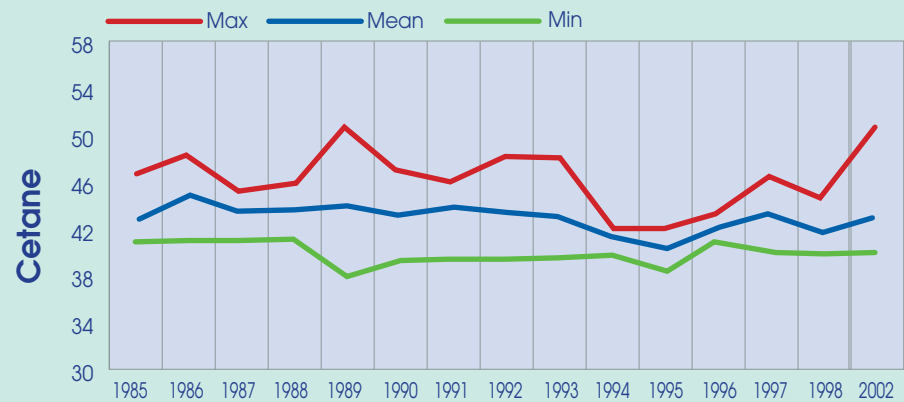
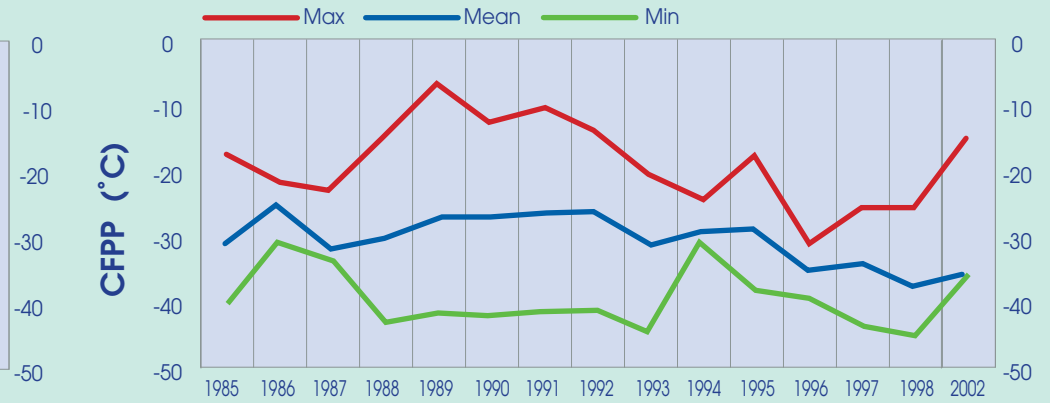
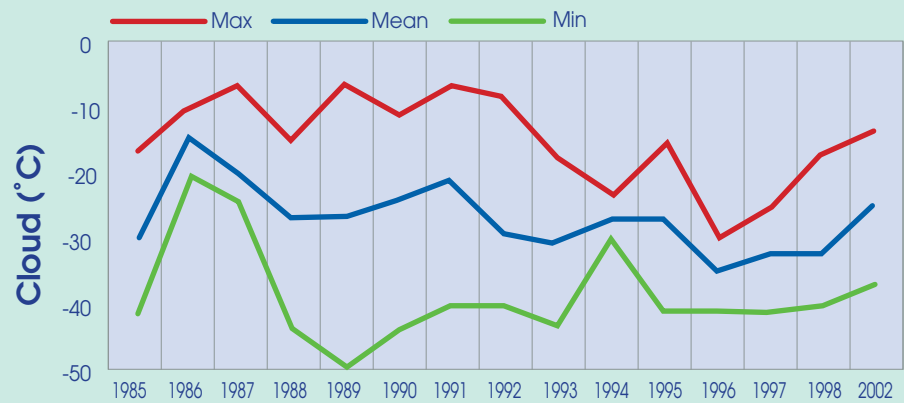
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-39	30441-40	30441-41	30441-42	30441-43	30441-44	30441-45	30441-46	30441-47
Cloud Point (°C)		-36	-25	-12	-24	-26	-32	-32	-12	-20	-36	-23	-22
Pour Point (°C)		-45	-35	-15	-45	-33	-42	-42	-15	-27	-42	-33	-39
CFPP (°C)		-34	-27	-13	-24	-28	-31	-34	-13	-24	-34	-27	-24
LTFT (°C)		-36	-26	-14	-26	-26	-32	-32	-14	-22	-36	-26	-24
HFRR (µm)	460 (max)	276	484	570	568	417	570	458	276	470	544	506	551
Wax Content (wt%) at 10°C Below Cloud		0.2	1.2	2.3	0.4	2.0	0.2	0.9	2.3	1.0	0.7	0.9	2.0
Density (kg/m <sup>3</sup> @ 15°C)		831.2	846.7	857.1	840.1	843.9	846.3	853.8	831.2	856.1	855.3	857.1	836.5
Sulphur (mg/Kg)		90	288	440	90	290	140	350	280	300	440	300	400
Viscosity @ 40°C (cSt)	1.7 - 4.1	1.89	2.47	3.05	3.05	2.88	2.08	2.27	2.30	2.44	2.38	2.96	1.89
Viscosity @ 20°C (cSt)		3.04	4.13	6.03	4.70	4.07	3.13	3.44	3.45	4.21	5.07	6.03	3.04
IBP		160	169	192	162	178	160	161	167	171	160	170	192
T <sub>10</sub>		182	193	210	182	202	182	185	195	198	185	197	210
T <sub>20</sub>		195	208	217	195	215	195	203	211	216	204	215	217
T <sub>50</sub>		239	253	264	244	251	239	255	258	264	262	263	241
T <sub>90</sub>	360 (max)	301	319	330	326	301	316	323	321	328	321	330	303
FBP		324	347	357	352	324	345	350	352	357	345	356	341
Calculated Cetane Index <sub>4Variable</sub>		41.0	43.9	50.9	44.1	44.6	41.0	41.3	50.9	43.0	41.5	42.6	46.5
Calculated Cetane Index <sub>2Variable</sub>		41.2	44.9	51.5	44.7	45.3	41.2	43.2	51.5	44.6	44.4	44.0	45.1
Cetane number	40 (min)	40.3	43.6	51.0	43.4	43.1	40.3	41.7	51.0	42.8	41.7	42.3	46.5



Contents



# CANADA - Key Trends



Contents



# MEXICO

## National standards and physical inspection data

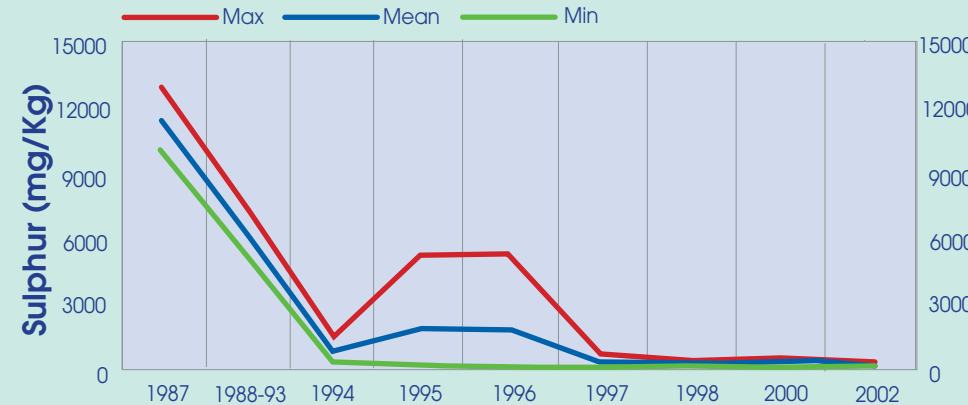
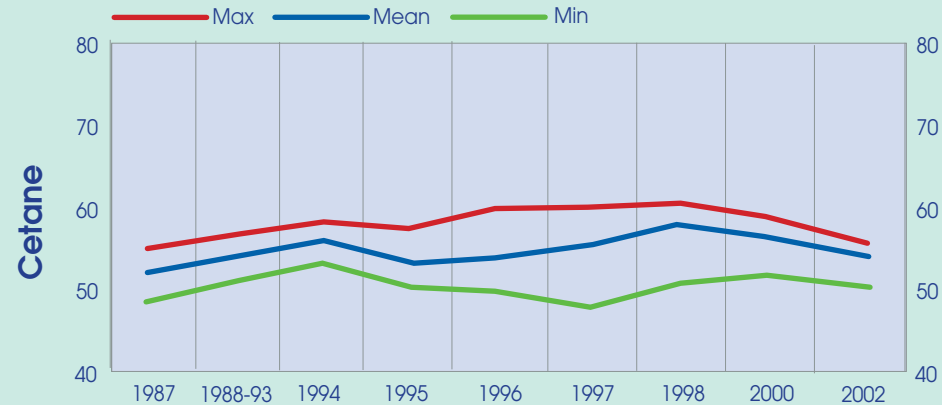
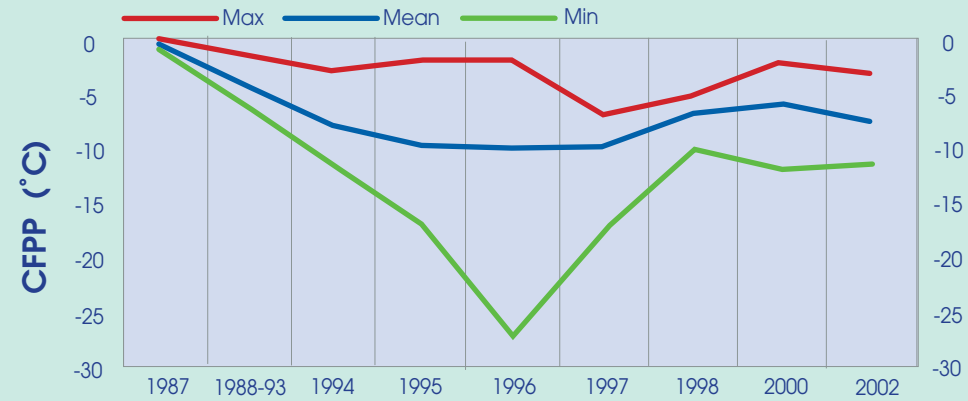
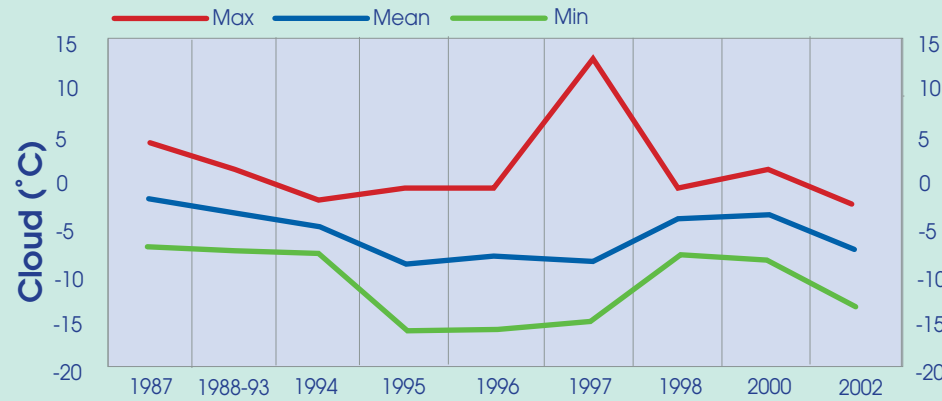
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					31795/02	31796/02	31797/02	31798/02	31799/02	31800/02			
Cloud Point (°C)		-13	-7	-2	-6	-4	-2	-13	-4	-11			
Pour Point (°C)	-5 (max)	-18	-12	-6	-12	-9	-6	-18	-9	-15			
CFPP (°C)		-11	-7	-3	-8	-7	-3	-11	-7	-6			
HFRR (µm)		438	499	561	561	545	508	491	451	438			
Wax Content (wt%) at 10°C Below Cloud		1.2	2.1	3.8	1.5	1.2	3.8	2.5	1.6	1.9			
Density (kg/m <sup>3</sup> @ 15°C)		826.2	834.3	844.0	832.6	833.2	844.0	826.2	829.7	840.2			
Sulphur (mg/Kg)	500 (max)	263	378	417	417	416	263	396	405	373			
Viscosity @ 40°C (cSt)	1.9 - 4.1	2.36	2.78	3.74	2.50	2.59	3.74	2.94	2.53	2.36			
Viscosity @ 20°C (cSt)		3.56	4.36	6.22	3.82	3.95	6.22	3.56	3.84	4.79			
IBP		146	168	209	170	153	209	165	146	165			
T <sub>10</sub>	275 (max)	198	211	247	198	201	247	199	202	221			
T <sub>20</sub>		211	225	259	211	213	259	214	216	237			
T <sub>50</sub>		257	267	288	258	260	288	257	261	278			
T <sub>90</sub>	345 (max)	323	337	344	337	340	339	323	341	344			
FBP		348	369	377	373	377	363	348	374	377			
Calculated Cetane Index <small>4Variable</small>		50.6	52.8	55.9	50.6	51.2	55.9	53.2	52.8	53.1			
Cetane Number		50.7	53.5	56.5	50.8	50.7	56.5	54.1	54.0	54.6			



Contents



# MEXICO – Key Trends



Contents



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-1	30441-2	30441-3	30441-4	30441-5	30441-6	30441-7	30441-8	30441-9
Cloud Point (°C)		-17	-12	-9	-9	-11	-10	-13	-12	-17	-15	-16	-12
Pour Point (°C)		-42	-30	-15	-15	-21	-30	-24	-21	-39	-36	-36	-33
CFPP (°C)		-33	-22	-9	-9	-11	-24	-12	-10	-33	-31	-33	-28
LTFT (°C)		-23	-16	-10	-10	-12	-14	-16	-12	-21	-18	-23	-22
HFRR (µm)		298	395	545	365	439	376	545	494	394	298	384	306
Wax Content (wt%) at 10°C Below Cloud		1.5	1.9	2.3	2.3	2.1	2.1	1.8	2.3	1.9	1.6	1.7	1.7
Density (kg/m <sup>3</sup> @ 15°C)		838.0	847.5	864.7	864.7	849.1	857.8	843.7	850.1	844.8	840.8	838.0	846.2
Sulphur (mg/Kg)	500 (max)	280	357	420	360	370	370	330	420	280	350	350	340
Viscosity @ 40°C (cSt)	1.9 - 4.1	2.16	2.43	2.69	2.46	2.62	2.69	2.50	2.69	2.16	2.26	2.32	2.32
Viscosity @ 20°C (cSt)		3.20	3.68	4.16	3.89	4.04	4.16	3.80	4.10	3.20	3.22	3.36	3.50
IBP		167	179	186	171	186	180	186	186	178	178	182	172
T <sub>10</sub>		194	207	218	203	215	216	213	218	200	203	203	201
T <sub>20</sub>		210	220	231	221	230	231	225	231	210	214	214	214
T <sub>50</sub>		249	260	270	268	269	270	260	267	249	252	251	256
T <sub>90</sub>	282 - 338	309	321	325	325	325	325	321	324	309	317	316	321
FBP		337	348	352	352	350	352	350	351	337	343	344	348
Calculated Cetane Index <sub>4Variable</sub>	40 (min)	40.7	45.9	48	40.7	47.5	44.5	47.9	47.1	44.2	46.7	47.5	45.3
Calculated Cetane Index <sub>2Variable</sub>	40 (min)	42.8	46.4	49.1	42.8	47.8	45.3	47.6	47.1	44.5	46.6	47.3	45.8
Cetane number	40 (min)	38.3	44.7	47.8	38.3	47.8	43.4	46.7	45.7	42.8	46.2	45.7	43.4



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## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-10								
Cloud Point (°C)		-17	-12	-9	-9								
Pour Point (°C)		-42	-30	-15	-42								
CFPP (°C)		-33	-22	-9	-26								
LTFT (°C)		-23	-16	-10	-14								
HFRR (µm)		298	395	545	353								
Wax Content (wt%) at 10°C Below Cloud		1.5	1.9	2.3	1.5								
Density (kg/m <sup>3</sup> @ 15°C)		838.0	847.5	864.7	839.4								
Sulphur (mg/Kg)	500 (max)	280	357	420	400								
Viscosity @ 40°C (cSt)	1.9 - 4.1	2.16	2.43	2.69	2.31								
Viscosity @ 20°C (cSt)		3.20	3.68	4.16	3.55								
IBP		167	179	186	167								
T <sub>10</sub>		194	207	218	194								
T <sub>20</sub>		210	220	231	210								
T <sub>50</sub>		249	260	270	260								
T <sub>90</sub>	282 - 338	309	321	325	325								
FBP		337	348	352	351								
Calculated Cetane Index <sub>4Variable</sub>	40 (min)	40.7	45.9	48	48.0								
Calculated Cetane Index <sub>2Variable</sub>	40 (min)	42.8	46.4	49.1	49.1								
Cetane number	40 (min)	38.3	44.7	47.8	46.5								

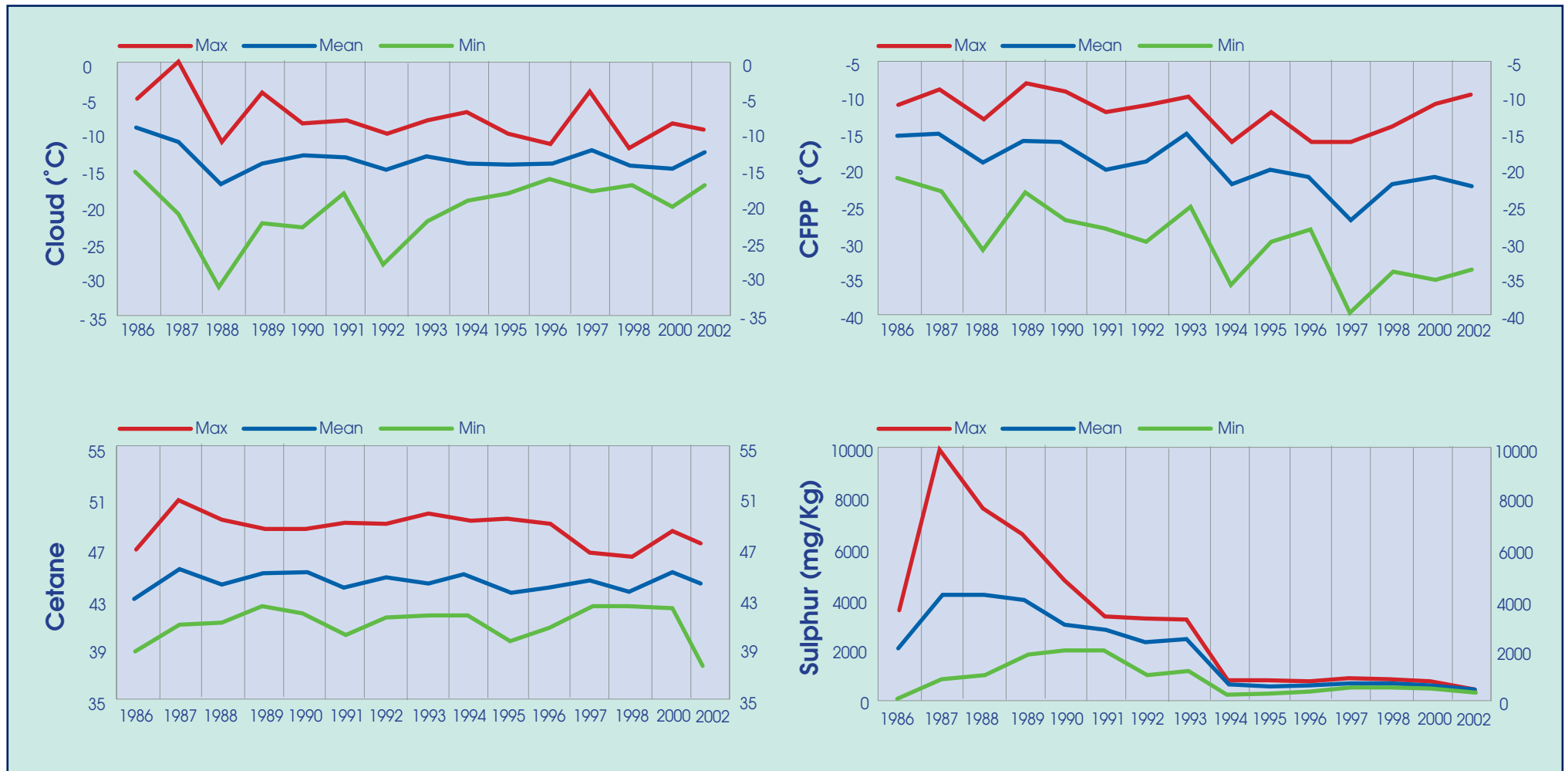


Contents





# USA EAST – Key Trends



Data points before 1990 are East, Midwest and West combined



Contents



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-11	30441-12	30441-13	30441-14	30441-15	30441-22	30441-23	30441-24	30441-25
Cloud Point (°C)		-25	-15	-6	-17	-16	-17	-25	-25	-9	-6	-10	-8
Pour Point (°C)		-45	-26	-12	-27	-27	-36	-33	-33	-18	-12	-18	-15
CFPP (°C)		-33	-19	-10	-26	-20	-33	-26	-26	-10	-16	-11	-11
LTFT (°C)		-25	-18	-11	-19	-18	-21	-25	-25	-11	-14	-13	-11
HFRR (µm)		296	493	581	552	402	525	535	521	413	447	519	409
Wax Content (wt%) at 10°C Below Cloud		0.8	1.7	3.3	0.8	3.1	1.2	1.4	1.1	2.4	1.0	3.0	1.5
Density (kg/m <sup>3</sup> @ 15°C)		824.4	854.1	872.3	864.0	845.5	856.2	856.5	859.3	872.3	857.2	844.7	859.6
Sulphur (mg/Kg)	500 (max)	260	376	490	410	330	400	330	310	370	380	420	360
Viscosity @ 40°C (cSt)	1.9 - 4.1	2.19	2.77	3.41	2.64	2.45	2.52	2.56	2.60	2.53	2.74	2.76	2.86
Viscosity @ 20°C (cSt)		3.30	4.38	5.95	4.17	3.68	3.88	3.94	4.00	5.43	4.29	4.27	4.53
IBP		176	189	198	190	193	188	198	190	198	184	176	190
T <sub>10</sub>		202	218	237	217	217	215	225	228	237	215	223	221
T <sub>20</sub>		214	230	250	228	226	226	235	237	250	227	239	233
T <sub>50</sub>		248	264	281	261	257	258	260	262	281	264	272	268
T <sub>90</sub>	282 - 338	300	320	333	323	302	316	300	302	333	331	322	330
FBP		327	350	368	356	328	352	327	328	356	368	346	362
Calculated Cetane Index <sub>4Variable</sub>	40 (min)	41.4	45.1	52.4	41.4	46.3	43.1	43.1	42.7	42.7	44.3	50.3	44.4
Calculated Cetane Index <sub>2Variable</sub>	40 (min)	41.5	45.1	51.7	41.5	46.3	43.1	43.5	43.1	43.1	44.2	49.9	44.3
Cetane number	40 (min)	40.2	43.8	50.9	43.4	43.6	45.7	40.2	40.2	42.8	42.3	48.1	41.7



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## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-26	30441-27	30441-28	30441-29	30441-30	30441-31	30441-32	30441-33	30441-34
		Min	Mean	Max									
Cloud Point (°C)		-25	-15	-6	-15	-12	-17	-17	-11	-19	-17	-22	-14
Pour Point (°C)		-45	-26	-12	-21	-21	-27	-24	-21	-27	-45	-36	-21
CFPP (°C)		-33	-19	-10	-16	-19	-18	-18	-11	-17	-31	-19	-13
LTFT (°C)		-25	-18	-11	-17	-15	-17	-17	-13	-20	-23	-22	-16
HFRR (µm)		296	493	581	521	517	418	296	517	567	532	571	528
Wax Content (wt%) at 10°C Below Cloud		0.8	1.7	3.3	3.3	2.3	1.3	1.1	2.3	1.1	1.5	0.8	1.9
Density (kg/m <sup>3</sup> @ 15°C)		824.4	854.1	872.3	833.2	847.6	863.0	863.0	848.5	824.4	863.2	851.3	853.9
Sulphur (mg/Kg)	500 (max)	260	376	490	260	350	460	490	310	360	370	360	450
Viscosity @ 40°C (cSt)	1.9 - 4.1	2.19	2.77	3.41	2.19	2.67	3.09	2.96	3.41	3.20	2.68	2.86	3.14
Viscosity @ 20°C (cSt)		3.30	4.38	5.95	3.30	4.60	5.66	5.09	5.95	3.99	4.66	3.45	4.21
IBP		176	189	198	180	195	196	197	185	182	190	188	184
T <sub>10</sub>		202	218	237	205	215	224	225	221	202	218	209	216
T <sub>20</sub>		214	230	250	216	224	239	238	237	214	230	219	230
T <sub>50</sub>		248	264	281	255	262	276	276	273	249	263	248	266
T <sub>90</sub>	282 - 338	300	320	333	313	325	325	326	325	319	321	314	324
FBP		327	350	368	344	353	348	348	351	354	356	351	355
Calculated Cetane Index <sub>4Variable</sub>	40 (min)	41.4	45.1	52.4	50.2	47.1	43.9	44.0	48.8	52.4	41.8	42.9	45.4
Calculated Cetane Index <sub>2Variable</sub>	40 (min)	41.5	45.1	51.7	50.0	46.8	44.9	44.9	48.8	51.7	42.2	42.1	45.7
Cetane number	40 (min)	40.2	43.8	50.9	50.9	46.7	40.4	42.0	49.8	44.7	42.1	42.6	43.4



## National standards and physical inspection data

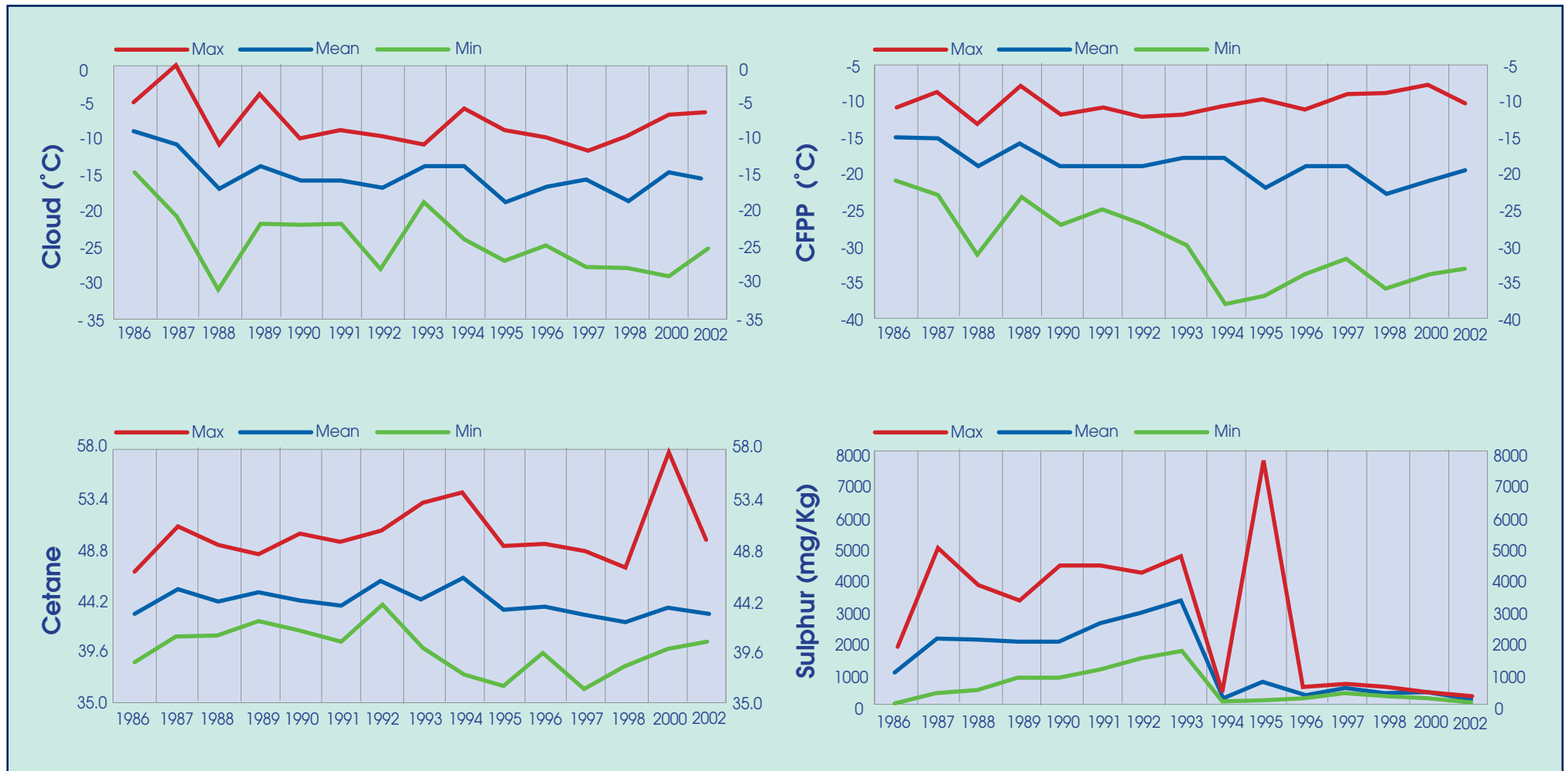
	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-35								
Cloud Point (°C)		-25	-15	-6	-17								
Pour Point (°C)		-45	-26	-12	-27								
CFPP (°C)		-33	-19	-10	-20								
LTFT (°C)		-25	-18	-11	-17								
HFRR (µm)		296	493	581	581								
Wax Content (wt%) at 10°C Below Cloud		0.8	1.7	3.3	0.9								
Density (kg/m <sup>3</sup> @ 15°C)		824.4	854.1	872.3	864.3								
Sulphur (mg/Kg)	500 (max)	260	376	490	420								
Viscosity @ 40°C (cSt)	1.9 - 4.1	2.19	2.77	3.41	2.68								
Viscosity @ 20°C (cSt)		3.30	4.38	5.95	4.21								
IBP		176	189	198	191								
T <sub>10</sub>		202	218	237	217								
T <sub>20</sub>		214	230	250	228								
T <sub>50</sub>		248	264	281	262								
T <sub>90</sub>	282 - 338	300	320	333	326								
FBP		327	350	368	359								
Calculated Cetane Index <sub>4Variable</sub>	40 (min)	41.4	45.1	52.4	41.6								
Calculated Cetane Index <sub>2Variable</sub>	40 (min)	41.5	45.1	51.7	41.6								
Cetane number	40 (min)	40.2	43.8	50.9	41.2								



Contents



# USA MIDWEST – Key Trends



Data points before 1990 are East, Midwest and West combined



Contents



## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					30441-16	30441-17	30441-18	30441-19	30441-20	30441-21	30441-36	30441-37	30441-38
Cloud Point (°C)		-17	-13	-5	-5	-17	-13	-13	-15	-16	-14	-12	-8
Pour Point (°C)		-45	-22	-12	-12	-24	-18	-18	-45	-21	-21	-24	-15
CFPP (°C)		-30	-16	-7	-7	-21	-13	-15	-30	-18	-17	-12	-8
LTFT (°C)		-19	-14	-6	-6	-19	-14	-16	-18	-17	-14	-12	-8
HFRR (µm)		380	519	661	449	661	616	482	380	561	599	470	452
Wax Content (wt%) at 10°C Below Cloud		0.8	2.1	4.8	2.9	1.3	2.1	2.9	2.0	4.8	1.0	0.8	1.1
Density (kg/m <sup>3</sup> @ 15°C)		820.8	836.9	853.7	837.9	849.7	820.8	853.7	848.4	824.8	833.0	832.5	831.0
Sulphur (mg/Kg)	500 (max)	80	267	390	80	<20	<20	390	300	380	100	240	380
Viscosity @ 40°C (cSt)	1.9 - 4.1	1.98	2.34	2.71	2.71	2.59	2.15	2.70	2.30	2.42	2.12	2.07	1.98
Viscosity @ 20°C (cSt)		2.89	3.70	4.23	4.19	3.98	3.17	4.18	3.46	3.64	4.23	3.57	2.89
IBP		176	185	200	181	200	195	193	176	191	178	177	178
T <sub>10</sub>		194	208	221	212	218	211	221	204	219	196	194	194
T <sub>20</sub>		202	218	233	226	227	218	233	218	229	205	202	202
T <sub>50</sub>		229	249	268	268	251	241	267	257	258	240	231	229
T <sub>90</sub>	282 - 338	302	313	328	328	312	304	320	314	302	315	312	313
FBP		326	345	357	357	342	337	353	340	326	347	349	352
Calculated Cetane Index <sub>4Variable</sub>	40 (min)	44.5	47.9	55.4	51.7	44.5	52.7	45.8	44.6	55.4	46.7	44.9	45.1
Calculated Cetane Index <sub>2Variable</sub>	40 (min)	43.2	47.0	53.8	51.4	43.2	50.8	46.0	45.4	53.8	46.0	43.4	43.3
Cetane number	40 (min)	44.0	51.6	56.0	53.5	56.0	52.0	46.2	44.0	56.0	54.9	50.9	50.9



Contents



# USA WEST - Key Trends



Data points before 1990 are East, Midwest and West combined



Contents



# AFRICA



Contents





# SOUTH AFRICA

## National standards and physical inspection data

	Specification	Minimum observed	Mean value	Maximum observed	Sample number								
					Min	Mean	Max	31600/02	31601/02	31602/02	31603/02	31604/02	
Cloud Point (°C)		0	2	4	4	2	0	2	3				
Pour Point (°C)		-12	-10	-9	-12	-9	-9	-9	-9				
CFPP (°C)	-4 (max)	-6	-5	-3	-5	-5	-6	-3	-4				
HFRR (µm)		333	403	479	333	371	449	385	479				
Wax Content (wt%) at 10°C Below Cloud		0.8	2.0	2.6	0.8	2.5	2.2	2.6	1.7				
Density (kg/m <sup>3</sup> @ 15°C)		826.9	848.6	855.8	826.9	855.8	855.5	854.4	850.4				
Sulphur (mg/Kg)	3000 (max)	39	2080	2870	39	2500	2760	2230	2870				
Viscosity @ 40°C (cSt)	1.6 - 5.3	2.26	3.11	3.78	2.26	3.41	3.61	3.78	2.47				
Viscosity @ 20°C (cSt)		3.25	4.93	6.32	3.25	5.52	5.73	6.32	3.85				
IBP		147	174	204	160	188	172	204	147				
T <sub>10</sub>		200	222	239	200	230	232	239	209				
T <sub>20</sub>		210	237	255	210	245	247	255	229				
T <sub>50</sub>		243	277	291	243	285	291	291	279				
T <sub>90</sub>	362 (max)	344	348	355	344	344	355	347	351				
FBP		370	378	390	390	370	378	374	380				
Calculated Cetane Index <small>4Variable</small>		48.3	49.6	51.1	49.8	48.8	50.0	51.1	48.3				
Cetane number	45 (min)	48.1	50.4	54.1	54.1	48.7	50.8	50.2	48.1				



Contents



# SOUTH AFRICA – Key Trends



Contents



# TEST METHODS



# TEST METHODS

*The majority of testing was carried out at quality accredited laboratories in the USA and UK where the following test methods were used:-*

<i>Density</i>	<i>ASTM D 4052</i>
<i>Kinematic Viscosity</i>	<i>ASTM D 445</i>
<i>Sulphur Content</i>	<i>ASTM D 2622</i>
<i>Cetane Number</i>	<i>ASTM D 613</i>
<i>Cetane Index</i>	<i>ASTM D 4737/ASTM D-976</i>
<i>Pour Point</i>	<i>ASTM D 97</i>
<i>Distillation</i>	<i>ASTM D 86</i>
<i>Cloud Point</i>	<i>ASTM D2500</i>
<i>CFPP</i>	<i>IP 309</i>
<i>HFRR</i>	<i>ISO 12156-1</i>
<i>Wax Content</i>	<i>Differential Scanning Calorimetry</i>
<i>LIFT</i>	<i>ASTM D4539</i>

*Samples collected in Japan were tested at local laboratories, using the same or similar test methods.*

*Data on Korean and Chinese diesel was provided directly by the local authorities so information on test methods used is not available.*



Contents



# ANALYSIS

*The analyses applied to each sample are those we consider will be of most interest to the diesel producers, distributors and consumers. They cover areas of national specification, exchange specification and performance parameters. A degree of standardisation has been applied to enable diesel from all countries to be compared and the data analysed as a single set. Standardisation and space restrictions however, mean that not all national specifications are reported.*

*For samples collected in the USA, low-temperature flow test (LTFT) results have been reported. These provide an indication of the vehicle performance limit which can be expected in the North American markets.*

*Wherever possible, industry standard test methods have been applied and in house test methods avoided. This has been done so that the data published here most accurately reflect the results which could or would be generated by organisations within the petroleum industry.*

*When considering our data, in particular when comparing the various test results with the national specifications, it should be noted that a number of the tests have quite wide reproducibility bands and very little repeat testing has been conducted to determine compliance or otherwise with the specifications.*

