Aggiornamento metodi DCN
&
Attività CEN/TC 19/WG35

Riunione plenaria UNICHIM
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Metodi DCN

- Apparecchiature di tipo CVCC (*Constant volume combustion chamber*)
- Metodi alternativi alla determinazione del numero di cetano (CN) con il metodo motoristico
- 3 metodi ufficiali, 1 in sviluppo:
  - prEN 15195:2013 (IQT), update scopo e precisione
  - EN 16144:2012 (FIT)
  - ASTM D7668:2012 (CID 510), è ancora *preliminary method*, in fase di approvazione il RRT che ha definito la precisione. E' previsto lo sviluppo di un metodo CEN
  - Advanced Fuel Ignition Delay Analyzer (AFIDA), in fase di sviluppo

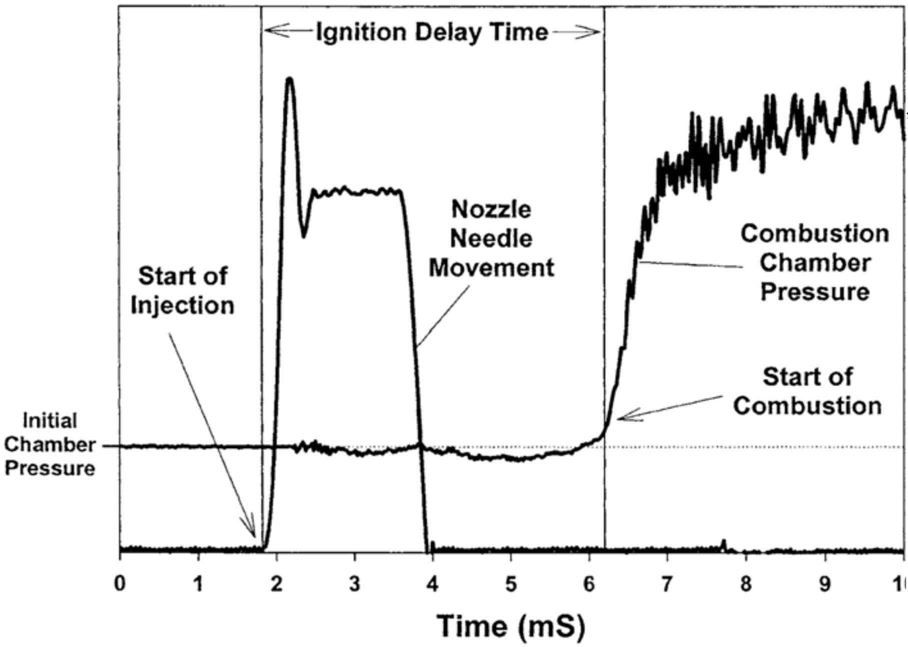
Metodi DCN

- I primi due metodi sviluppati sono elencati nella EN 590:2013

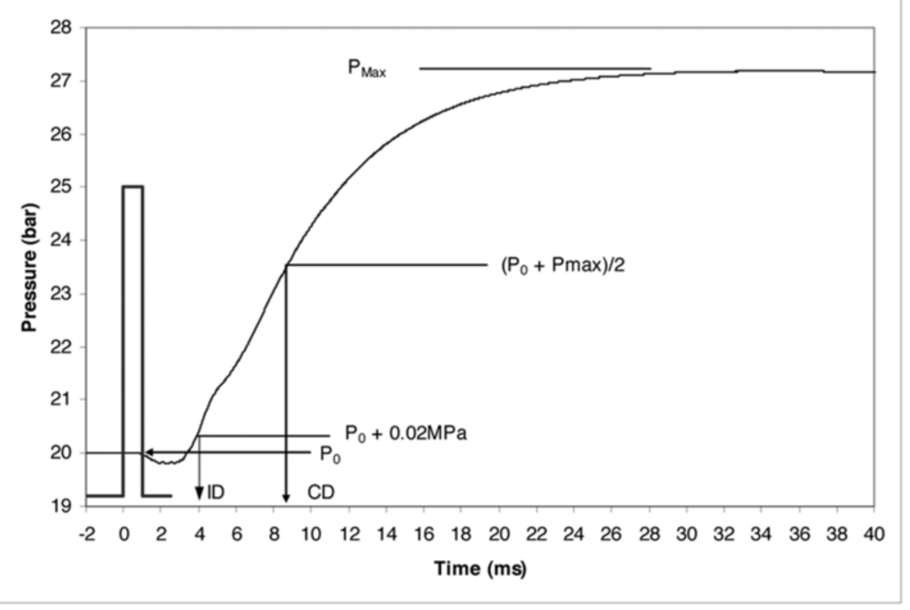
Caratteristica	Unità	Limiti		Metodo di prova
		Minimo	Massimo	
Numero di cetano		51,0	-	EN ISO 5165 EN 15195 EN 16144

- Il metodo motore è il metodo da utilizzarsi in caso di disputa

Ignition Delay e Combustion Delay



EN 15195
EN 16144

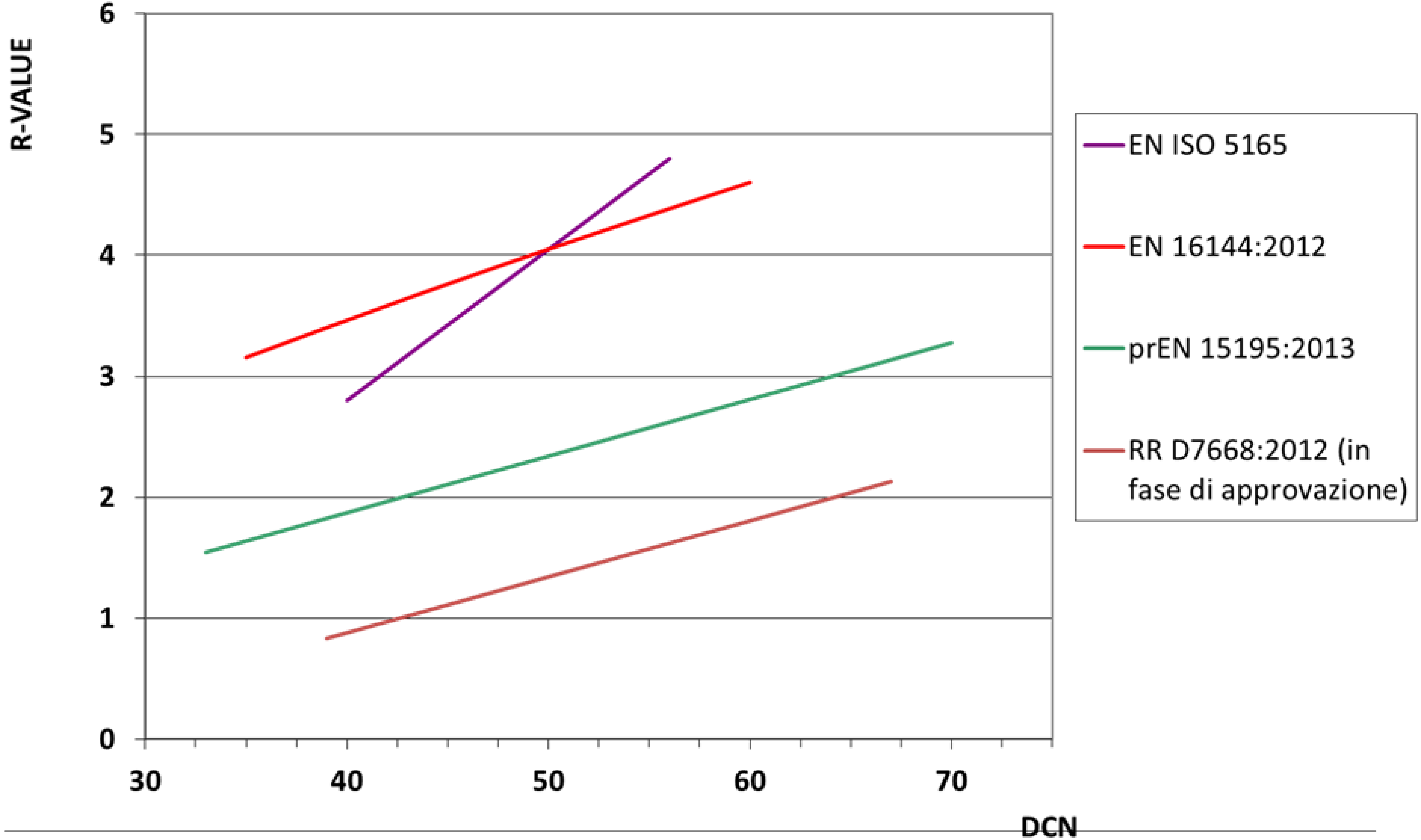


ASTM D7668

Metodi DCN

<table>
<tr><th>Method</th><th>IQT</th><th>FIT</th><th>CID 510</th></tr>
<tr><td rowspan="2">Principle</td><td colspan="3">Heated constant volume combustion chamber (CVCC) with chamber pressure sensor and injector movement sensor</td></tr>
<tr><td colspan="2">Ignition delay (<u>ID</u>) measurement</td><td>Ignition delay (<u>ID</u>) and combustion delay (<u>CD</u>) measurement</td></tr>
<tr><td>Combustion chamber</td><td>0,213 ± 0,002 l</td><td>0,60 ± 0,03 l</td><td>0,473 l ± 0,005 l</td></tr>
<tr><td>Fuel injection</td><td colspan="2">Pintle type injector (ISO 4010)</td><td>Electronically controlled High Pressure Injector, multiple nozzles</td></tr>
<tr><td>Injection period</td><td>mass calibration
(during maintenance)</td><td>manually controlled
5,00 ± 0,25 ms
(average of 25 test cycles)</td><td>computer controlled
0,8 ms to 1,5 ms</td></tr>
<tr><td>Conversion equation</td><td>DCN = 4,460 + 186,6/ID</td><td>DCN = 171/ID</td><td>DCN = (-0.5245 * ID) + (-0.2566 * ID^2) + (0.1932 * CD) + (-0.001993 * CD^2) + (46.857 * ID/CD) + 39.903</td></tr>
</table>

Metodi DCN: scopo e precisione



WG 35 – feasibility study

- CEN/TC 19/WG 24 had requested in 2010 a <u>single EN test method</u> for the ignition quality testing of fuels based upon Derived Cetane Number test methods using Constant Volume Combustion chamber (CVCC) techniques

- <u>Calibration</u> using blends of EN ISO 5165 primary reference fuels is under investigation

- PRFs: n-hexadecane and heptamethylnonane (HMN)

WG 35 – feasibility study

- The main benefit is that, using PRFs with known cetane number, it is possible to set a curve of ignition delay (ID) vs cetane number (CN), hence <u>avoiding the correlation</u> DCN vs.CN

- Once established, the calibration curve based of blends of PRFs should be checked at regular intervals (to be defined) and NOT before every sample to be tested: time and costs saving compared to engine, no difference compared with the published DCN test methods

WG 35 – feasibility study

- The preliminary results provided so far, most of them with the IQT (EN 15195), showed that:
  - In the low cetane range the results seems to underestimate the CN values (bias). This could be related to the absence of turbolence inside the combustion chamber that could limit the fuel vaporization and hence the combustion quality (i.e.CN)
  - In the upper cetane range the correlation between the results obtained and CN values seems to be better, probably because in this range the fuel vaporization has a lower impact

WG 35 – feasibility study

- The impact of (peroxide) contamination of the PRFs blends in the results obtained is also under investigation and is suspected to cause the bias

- The 4th CVCC instrument development is on-going. Its calibration is anchored to the CN scale and there is no correlation equation DCN vs CN (like in WG 35 feasibility study)