

GIRK KALUN d.d. – LIME, LIMESTONE AGREGGATES & CONCRETE PRODUCTION

CO₂ EMISSION MONITORING PLAN



BASIC COMPANY DATA

- Founded in 1959.
- 100 - 120 employees
- Production:
 - Lime
 - Stone Aggregates & Concretes
 - Waste management
- 120.000 t/a lime; 1.000.000 t/a limestone



CO₂ EMISSIONS FROM THE PLANT: EMISSIONS FROM LIME PRODUCTION (2 ASK LIME KILNS)

PROCESS EMISSIONS

- Limestone

EMISSIONS FROM FUELS

LIQUID FUELS:

- Heavy oil
- Light oil
- Waste oil

SOLID FUELS:

- Petroleum coke
- Biomass
- Waste biomass
- Waste biomass – dangerous waste
- Industrial waste



PROCESS EMISSIONS

Limestone calcination

(Limestone is burned on temperatures over 1000°C)

Relevant data concerning CO_2 emission from limestone:

1. Limestone consumption
2. CaCO_3 and MgCO_3 content in limestone
3. CaCO_3 and MgCO_3 content in lime product (unreacted limestone)



PROCESS EMISSIONS

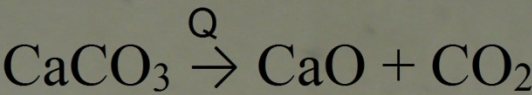
Limestone consumption

Load cells (every batch of the limestone entering the kiln is weighted, and weight recorded in sql database)



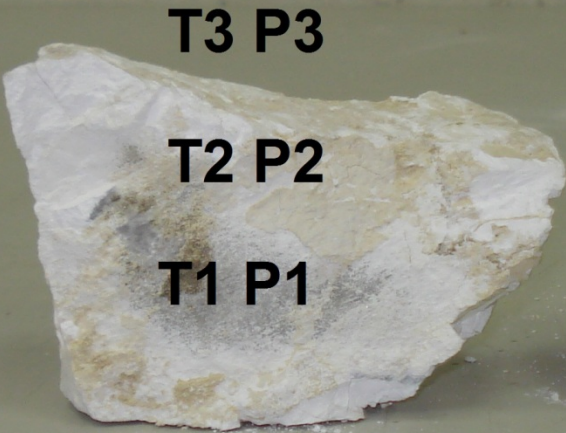
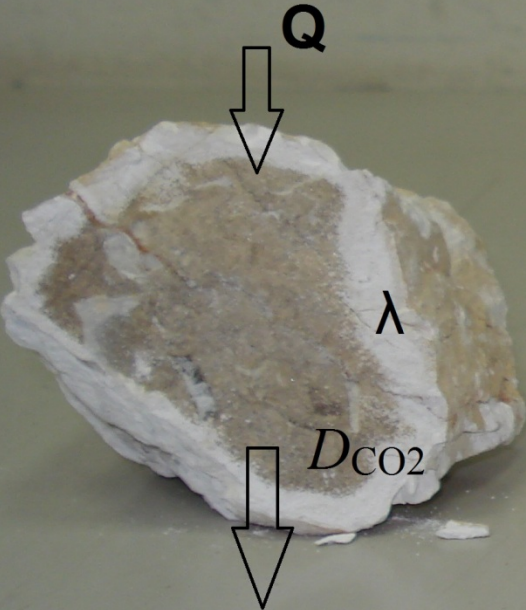
| ID | Vijene | |
|--------|--------------------|------|
| 209450 | 21.4.2015 15:46:40 | 2697 |
| 209451 | 21.4.2015 15:55:40 | 2697 |
| 209452 | 21.4.2015 16:04:40 | 2699 |
| 209453 | 21.4.2015 16:33:23 | 2706 |
| 209454 | 21.4.2015 16:41:53 | 2686 |
| 209455 | 21.4.2015 17:16:08 | 2676 |
| 209456 | 21.4.2015 17:24:18 | 2697 |
| 209457 | 21.4.2015 17:37:23 | 2680 |
| 209458 | 21.4.2015 17:54:03 | 2699 |
| 209459 | 21.4.2015 18:30:36 | 2699 |
| 209460 | 21.4.2015 18:52:43 | 2688 |
| 209461 | 21.4.2015 19:02:40 | 2706 |
| 209462 | 21.4.2015 19:26:00 | 2700 |
| 209463 | 21.4.2015 19:35:10 | 2680 |
| 209464 | 21.4.2015 19:44:33 | 2680 |
| 209465 | 21.4.2015 19:53:26 | 2689 |
| 209466 | 21.4.2015 20:32:03 | 2669 |
| 209467 | 21.4.2015 20:41:48 | 2676 |
| 209468 | 21.4.2015 21:09:13 | 2697 |
| 209469 | 21.4.2015 21:18:13 | 2680 |
| 209470 | 21.4.2015 21:34:26 | 2697 |
| 209471 | 21.4.2015 22:00:43 | 2689 |
| 209472 | 21.4.2015 22:08:36 | 2670 |
| 209473 | 21.4.2015 22:34:53 | 2680 |
| 209474 | 21.4.2015 22:51:26 | 2680 |
| 209475 | 21.4.2015 23:10:13 | 2719 |
| 209476 | 21.4.2015 23:37:23 | 2697 |
| 209477 | 21.4.2015 23:52:13 | 2697 |
| 209478 | 22.4.2015 0:26:43 | 2687 |
| 209479 | 22.4.2015 0:34:16 | 2688 |
| 209480 | 22.4.2015 0:42:46 | 2700 |
| 209481 | 22.4.2015 1:21:20 | 2688 |

PROCESS EMISSIONS
ANALYSIS DATA



$$K_p = p_{\text{CaO}} * p_{\text{CO}_2} / p_{\text{CaCO}_3}$$

$$K_p = p_{\text{CO}_2}$$



$$T1 < T2 < T3$$

$$P1 > P2 > P3$$

CaCO3 and MgCO3
content in limestone

CO2 content in lime product
(Important for conversion factor
calculation)

REZULTATI ISPITIVANJA:

Metoda ispitivanja svakog parametra navedena je u tablici.

| Svojstvo | Rezultat ispitivanja (% mase) | |
|---|----------------------------------|-----------------------|
| | Pojedinačni rezultat | Srednja vrijednost |
| Sadržaj kalcijevog oksida, CaO (u skladu s točkom 5.2.5.1 norme HRN EN 459-2:2010) | 83,59 83,59 | 83,59 |
| Sadržaj magnezijevog oksida, MgO (u skladu s točkom 5.2.5.2 norme HRN EN 459-2:2010) | 0,32 0,32 | 0,32 |
| Sadržaj ugljikovog dioksida, CO2 (u skladu s točkom 5.5.4 norme HRN EN 459-2:2010) | 11,87 11,95 | 11,91 |

REZULTATI ISPITIVANJA:

Metoda ispitivanja svakog parametra navedena je u tablici.

| Svojstvo | Rezultat ispitivanja (% mase) | |
|---|----------------------------------|-----------------------|
| | Pojedinačni rezultat | Srednja vrijednost |
| Sadržaj kalcijevog oksida, CaO (u skladu s točkom 5.2.5.1 norme HRN EN 459-2:2010) | 55,58 55,58 | 55,58 |
| Sadržaj magnezijevog oksida, MgO (u skladu s točkom 5.2.5.2 norme HRN EN 459-2:2010) | 0,16 0,16 | 0,16 |
| Sadržaj ugljikovog dioksida, CO2 (u skladu s točkom 5.5.4 norme HRN EN 459-2:2010) | 43,34 43,38 | 43,36 |

EMISSIONS FROM SOLID BIOMASS FUELS

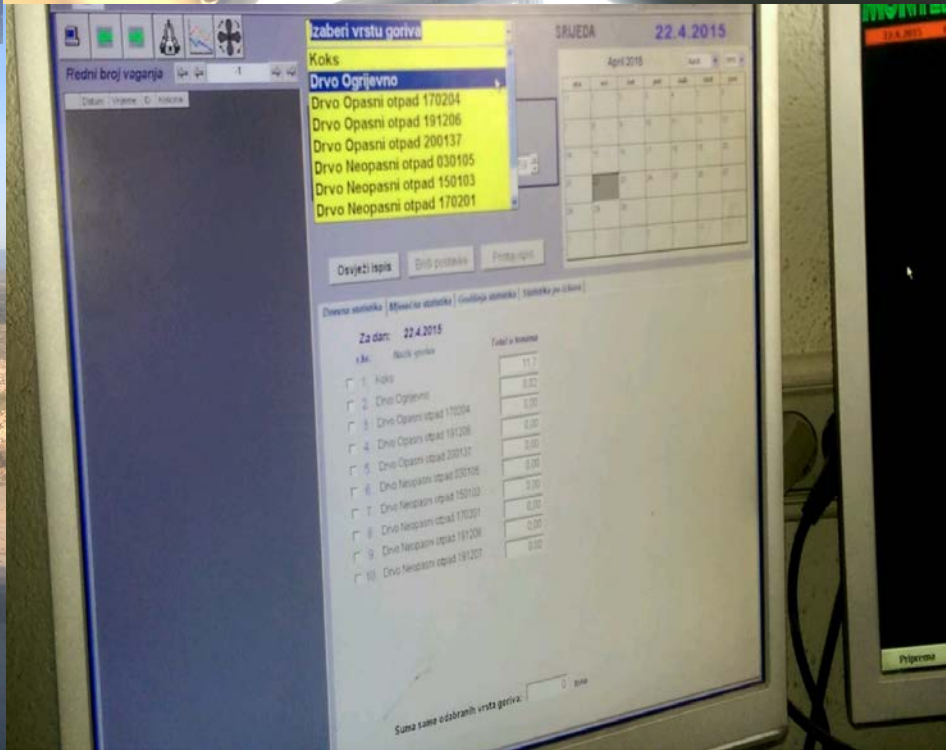
Relevant data:

- Consumption
- NCV
- EF
- OF
- BioC (for waste biomass)



EMISSIONS FROM SOLID BIOMASS FUELS

- Consumption



EMISSIONS FROM SOLID BIOMASS FUELS

- NCV
- EF
- OF
- BioC (for waste biomass)

| ZNAČAJKE KVALITETE | JEDINICE | ISPITNE METODE | REZULTAT suh | REZULTAT suh na zraku |
|------------------------------------|----------------------|---------------------|-----------------|--------------------------|
| Sadržaj vlage analitičkog uzorka * | mas. % | HRN EN 14774-3:2010 | - | 6,3 |
| Sadržaj pepela * | mas. % | HRN EN 14775:2010 | 11,4 | 10,7 |
| Sadržaj sumpora | mas % | HRN EN 15289:2011 | 0,2 | 0,2 |
| Sadržaj ugljika * | mas. % | HRN EN 15104:2011 | 50,2 | 47,0 |
| Sadržaj vodika * | mas % | HRN EN 15104:2011 | 5,1 | 5,5 |
| Sadržaj dušika * | mas. % | HRN EN 15104:2011 | 0,38 | 0,36 |
| Ogrijevna vrijednost, gornja | MJ/kg | HRN EN 14918:2010 | 19,34 | 18,12 |
| Ogrijevna vrijednost, donja | MJ/kg | HRN EN 14918:2010 | 18,23 | 17,08 |
| Emisijski faktor | tCO ₂ /TJ | račun | - | 100,90 |

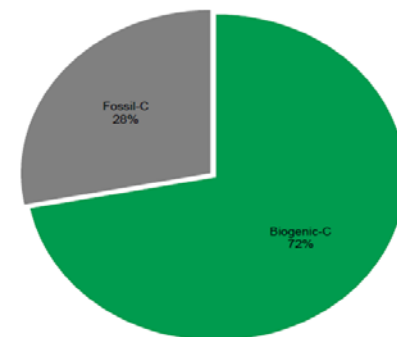


EN-15440:2011 - % Biogenic Carbon

Submitter: GIRK Kalin D.D
 Submitter Label: 1-ODOO-14 - 12.02.2014
 Laboratory Number: Beta-399309
 Material: Biogenic Material
 Date Received: December 12, 2014
 Date Reported: December 19, 2014

Percent Biogenic Carbon: 72 % *

Proportions Biogenic vs. Fossil Carbon
Indicated by ¹⁴C content



EMISSIONS FROM LIQUID FUELS:

Relevant data:

- Consumption
- NCV
- EF
- OF

NCV, EF determined periodically by analysis

OZNAKA UZORKA NARUČITELJA: 6-LU-14
VRSTA UZORKA: Ekstra lako loživo ulje
NAZIV I ADRESA NARUČITELJA ISPITIVANJA: GIRK Kalun d.d.
S. Radića 5, 22320 Drniš
ISPORUČENA KOLIČINA UZORKA: 1 l
DATUM DOSTAVE UZORKA U CKTL: 09.01.2015.
PERIOD ISPITIVANJA: 12.01.2015. - 19.01.2015.

REZULTATI ANALIZE:

| ZNAČAJKE KVALITETE | Jedinice | ISPITNE METODE | REZULTAT |
|--|----------------------|---------------------------------|----------|
| Sadržaj sumpora <input checked="" type="checkbox"/> | mas.% | HRN EN ISO 8754 :2004 | 0,050 |
| Sadržaj ugljika <input checked="" type="checkbox"/> | mas.% | ASTM D 5291-10 | 83,95 |
| Sadržaj vodika <input checked="" type="checkbox"/> | mas.% | ASTM D 5291-10 | 13,65 |
| Sadržaj dušika <input checked="" type="checkbox"/> | mas.% | ASTM D 5291-10 | 0,00 |
| Ogrjevna vrijednost,gornja <input checked="" type="checkbox"/> | MJ/kg | ASTM D 240-09 | 46,085 |
| Ogrjevna vrijednost,donja <input checked="" type="checkbox"/> | MJ/kg | ASTM D 240-09 | 43,110 |
| Emisijski faktor | tCO ₂ /TJ | Uredba komisije (EU)br.601/2012 | 71,35 |

EMISSIONS FROM LIQUID FUELS

Consumption determined by stock method
Scale (Fuel delivery vehicles are weighted)



- EMISSIONS FROM LIQUID FUELS
- Fuel stock determination at the beginning and at the end of the year
- Density of the fuels analysed (for the calculation of the mass of the fuel in storage)

OZNAKA UZORKA NARUČITELJA:

7-LU-14

VRSTA UZORKA:

Ekstra lako loživo ulje

NAZIV I ADRESA NARUČITELJA ISPITIVANJA:

GIRK Kalun d.d.
S. Radića 5, 22320 Drniš

ISPORUČENA KOLIČINA UZORKA:

3 l

DATUM DOSTAVE UZORKA U CKTL:

09.01.2015.

PERIOD ISPITIVANJA:

12.01.2015. - 16.01.2015.

REZULTATI ANALIZE:

| ZNAČAJKE KVALITETE | Jedinice | ISPITNE METODE | REZULTAT |
|--------------------|-------------------|----------------------|----------|
| Gustoća na 15 °C | kg/m ³ | HRN EN ISO 3675:2002 | 831,1 |

EMISSIONS FROM PETROLEUM COKE AND INDUSTRIAL WASTE STOCK METHOD

Similar as liquid fuel method

Sample submitted as **PETROLEUM COKE**

Marked **Composite sample**

Testing completed **22/May/2014**

Lab number **F 22032**

CERTIFICATE OF ANALYSIS

| Test | Unit | Method | Result | |
|---------------------|----------------------|-----------|--------|--------|
| | | | Prefix | Figure |
| NET CALORIFIC VALUE | kcal/kg | D 5865-04 | | 7664 |
| EMISSION FACTOR | tCO ₂ /TJ | DIN CE 87 | | 94,11 |
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| | | | | |
| | | | | |

NCV and EF determined by analysis

STOCK DETERMINED BY GEOMETRICAL
MEASUREMENTS



ALTERNATIVE POSSIBILITY!

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)



HVALA NA PAŽNJI!

