Gas cleaning for fluid catalytic cracking plants in refineries

Emission Control by GEA Bischoff

GEA Bischoff Customised Gas Cleaning Systems for fluid catalytic cracking (FCC) Units

Refineries vary by complexity; more complex refineries have more secondary conversion capability, meaning they can produce different types of petroleum products.

Fluid catalytic cracking, a type of secondary unit operation, is mainly producing additional lighter oil fractions out of the crude oil.

One of our most important activities in the refinery industry is gas cleaning for FCC units. GEA Bischoff technologies combine engineering process engineering, environmental aspects and energy savings. Taken this into account, GEA Bischoff offers clean air solutions while keeping the CAPEX/ OPEX low.

With this extensive portfolio and a long experience of 100 years, we can handle the challenges posed by your specific production process.

GEA builds electrostatic precipitator absorber (EP-Absorber), electrostatic precipitator (ESP) and selective catalytic reduction (SCR) plants.

Example FCC gas cleaning: CITGO refinery, Lemont (USA)

Electrostatic Precipitator Absorber

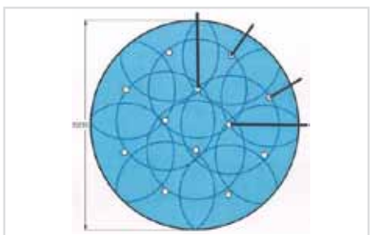
FEATURES OF GEA EP-ABSORBER FOR FCC

- Low pressure drop over EP-Absorber:
  - Removal of particulate/ aerosols by electrostatic forces vs. pressure drop (venturi systems)
  - No additional booster fan
  - Less energy consumption
  - No boiler reinforcements for increased operating pressure
- Lower emissions compared to conventional SO_2-Scrubbers
- No brownish trailing SO_3 plume
- Scrubber nozzles with hollow cone to avoid clogging
- Easy nozzle maintenance and replacement during operation
- Heavy duty discharge electrodes for long run times
- Redundant high quality T/R- sets and Controllers
- Redundant pumps
- Specific effluent treatment according to client´s needs

EP-Absorber with soda ash reagent storage, pump house and control building.

Reference example: Tesoro Corporation, Tesoro (USA)

Absorber section



Optimized spray arrangement

Uniform flux density

Hollow cone nozzles to avoid clogging

Easy maintenance and replacement during operation

Wet ESP Section

Tube bundle and discharge electrodes

ADVANTAGES OF GEA EP-ABSORBER

FCC scrubbing system can be designed for	GEA EP-Absorber	Conventional FCC scrubbers
SO_2	equal emissions	base
SO_3 (H_2SO_4 aerosol)	lower emissions	base
SOx (SO_2+SO_3)	lower emissions	base
Water droplets	lower emissions	base
Catalyst fines	lower emissions	base
NH_3 /Amonium aerosols	lower emissions	base
Pressure drop (e.g. for CO boilers)	lower	base
Required pressure for scrubbing nozzles	lower	base

Electrostatic Precipitator

FEATURES OF GEA DRY ESP FOR FCC

- Even flow distribution achieved by specially designed gas distribution walls that are proven by CFD-modelling.
- Use of optimised collecting electrode type ZT24
- Electrode rapping with reliable and robust tumbling hammer system superior to magnetic/top rapping
- Reliable Insulator design for long-term operation
- High Voltage supply with T/R-sets and Controllers
- No Ammonia injection needed
- Comprehensive experience in ESP design and project execution for FCC units

Reference example: Total MIDER Refinery, Leuna (Germany)

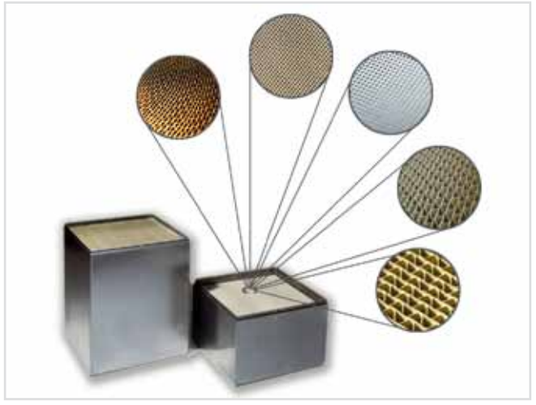
Installation of a three-field ESP …

… later addition of a fourth field to meet more stringent regulatory requirements

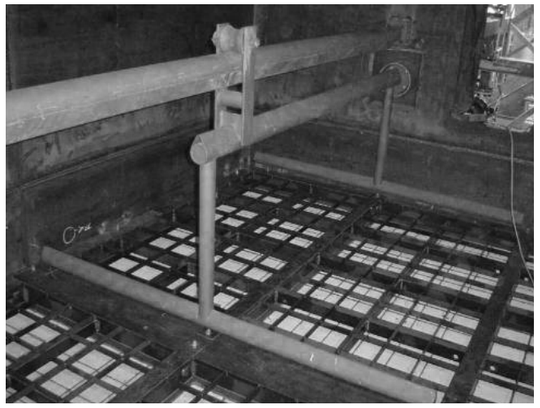
Selective Catalytic Reduction

FEATURES OF GEA SCR FOR FCC

- No catalyst fouling due to optimised inlet temperature
- Minimised Ammonia slip
- CAPEX and OPEX considerably lower than other DeNOx-systems such as Ozone generation – where additional health and safety aspects have to be considered.



Various catalyst modules



Soot blower system

GEA Health, Safety & Environment Management

All compound certificates of GEA Bischoff ISO 9001:2008 and SCC** are listed under: www.tuvdotcom.com (ID9105011330)

ATEX aspects will be consider in case of need it.

Customer needs

LET US KNOW INLET CONDITIONS AND THE ALLOWABLE CLEAN GAS EMISSIONS:

Dry Electrostatic Precipitator	Dust removal	> 98 % < 20 mg/Nm3
EP-Absorber	Dust removal	> 98 % < 20 mg/Nm3
	SO_2 removal	90 - 99 % < 75 mg/Nm3
	SO_3 removal	> 98 % < 20 mg/Nm3
Selective Catalytic Reduction (SCR)	NO_x removal	90 - 99 % < 75 mg/Nm3

YOU ARE WELCOME TO VISIT OUR REFERENCE PLANTS.

ANY OTHER REQUIREMENTS OR QUESTIONS?

We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

GEA Process Engineering

Business Unit GEA Emission Control

GEA Bischoff GmbH
Ruhrallee 311
45136 Essen, Germany
Phone: +49 201 8948 0
E-Mail: gea-bischoff@gea.com
www.geabischoff.com

GEA Process Engineering A/S
Gladsaxevej 305
2860 Søborg, Denmark
Phone: +45 3954 5454
E-Mail: niro@niro.dk

GEA Finland Oy
Hiomotie 19
00560 Helsinki, Finland
Mobile: +358 (0)10 322 11 00

GEA Process Engineering Inc.
9165 Rumsey Road
Columbia, MD 21045, USA
Phone: +1 410 997 8700

GEA Process Engineering China Ltd
Room 1405, CITIC Building, No. 19
Jian Guo Men Wai Street
Chao Yang District
Beijing, 100004, China
Phone: +86 10 8526 2025

GEA Process Engineering (Pty) Ltd.
286 16th Road
1685 Midrand, South Africa
Phone: +27 11 805 6910
Mobile: +27 72 479 9019

GEA Process Engineering SAS
23 Quai de Paludate
33 000 Bordeaux, France
Phone: +33 5 5795 9566

GEA Process Engineering S.p.A.
Centro Direzionale Milano 2
20090 Segrate (Mi), Italy
Phone: +39 02 2101 0611

GEA Process Engineering (India) pvt LTD
Coral Square, 3rd floor
Vijay Garden Naka
Ghodbunder Road
Thane (W) 400 607, India
Phone: +91 98 3006 9550

GEA Process Engineering, ООО
ГЕА Процессный инжиниринг
Semenovsky Val st. 6, bldg. 1
105094 Moscow, Russia
Phone: +7 495 787 2020

GEA Engenharia de Processos e Sis. Ind. Ltda.
Prédio 4 D2, 1 Floor, Office 2
13051-750 Campiñas, SP, Brazil
Phone: +55 19 3725 3001

www.gea.com