

KBR Ammonia Plant Revamp Project Experience



KBR's experience in ammonia plant revamps includes 200 projects. The objective of revamps has most often been to increase the plant capacity and/or to reduce the energy consumption.

A revamp project involves modifications to selected areas of the plant. Typical items for modifications are the primary reformer, the carbon dioxide removal system, the compressor internals and the synthesis converter. The modifications reflect any improvements in the state of the art (this sentence does not make sense. For example, in several projects, we added KBR's proprietary reforming exchanger KRES™ resulting in substantial increase in ammonia production. We have also modified conventional plants to Purifier™ plants to, both, save energy and increase capacity.

A revamp project is always preceded by a study to define the scope of the revamp. The study includes estimates of the cost and benefits of the proposed revamp. (See our separate experience list for revamp studies.)

KBR has successfully executed revamp projects and achieved proven performance ability in plants originally designed by us or by other licensors all over the world. We have done it repeatedly, and we have extensive data on the results of previous revamps. We also draw on our experience from licensing more than 248 grassroot ammonia plants globally. KBR has successfully revamped key equipment including primary reformer furnace, waste heat boilers, converters, and baskets of original design or by other licensors.

Following is a list of some of the ammonia plant revamps performed by KBR since 1990. We have identified the capacity increase projects by quoting the revamped capacity. KBR revamp projects performed as standalone proprietary equipment (PEQ), e.g., reformer furnace, converters, boiler, unitized chiller are identified. Revamp of non-KBR base plants is highlighted by [*] in KBR scope column.

Company/Location	Description of Revamp	Capacity MTPD	KBR Scope of Work	Year on Line
Dakota Gasification (DGC), USA	Feed change	1100 STPD	B	Ongoing
Acron AM2, Novgorod, Russia	Capacity increase and energy saving	1750 MTPD to 2300 MTPD	B + PEQ	Ongoing
Acron AM3, Novgorod, Russia	Capacity increase and energy saving	1750MTPD to 2300 MTPD	B + PEQ	Ongoing
PLNL, Point Lisas, Trinidad	Energy savings study	1850 MTPD	B	Ongoing
CF Woodward, OK, USA	Whole plant	1320 STPD to 1500 STPD	B, E	Ongoing
Nutrien, Fort Saskatchewan, Canada	Furnace and whole plant	1300 MTPD to 1500 MTPD	B, PEQ	Ongoing
KRIBHCO India LBED	Furnace and whole plant revamp	1890 MTPD X 2	LBED	Ongoing
Petrokemija, Croatia	Ammonia recovery unit	1360 MTPD	LBED	2018
Fertial, Annaba, Algeria	Synloop converter basket & 123-C	1500 MTPD	E, L, a PEQ	Ongoing
Fertial, Arzoo, Algeria	Synloop converter basket & 123-C	1500 MTPD	E, L, a PEQ	2019
Nutrien, Geismar, USA	Waste heat boiler upgrade	1750 STPD	E, a, PEQ	2019

Yara/BP Hull Basket	Ammonia converter basket	850 MTPD	E, a, PEQ	2018
RCF, Trombay V, India	Energy saving	1070 MTPD	BED	2019
Acron, Dorogobuzh, Russia	Capacity increase and energy saving	2100 MTPD	BED, PEQ	2019
SAFCO IBB, Al-Jubail, KSA	Capacity increase and energy saving	1650 MTPD	eB, FEED	2019
SPIC, Tuticorin, India	Capacity increase and energy saving	1300 MTPD	B, PEQ [*]	Ongoing
MCF, Manglore, India	Capacity increase and energy saving	880 MTPD	B, PEQ [*]	Ongoing
Green Dome Co, UAE	Capacity increase, relocation	1650 MTPD	eB, FEED	Ongoing
Agrium, Fort S., Canada	Replacement ammonia converter	1285 MTPD	E, PEQ	2019
Nutrien, Trinidad	HTS Exit WHB	1600 MTPD	E, PEQ	Ongoing
KFCL, Kanpur, India	Integrated ammonia/urea energy saving	1300 MTPD	B [*]	Ongoing
CFI, Woodward, OK, USA	Engineering of critical heat exchangers	1500 STPD	E Pa [*]	2016
Koch Brandon, Canada	Furnace convection section	1200 MTPD	E	2016
YPF, Barrup, Australia	Replacement ammonia converter basket	2200 MTPD	PEQ	Ongoing
Nutrien, Augusta, USA	Purifier based capacity & energy gain	2500 STPD	Early Work	2016
Petrokemija, Kutina, Croatia	High pressure condensate Stripping	–	B	2018
SABIC, SAFCO-III, KSA	Capacity increase and energy saving revamp,	1800 MTPD	eB, FEED	In EPC
SAFCO-IBB, KSA	Furnace reharp, Aux boiler, transfer line	1600 MTPD	E	2016
PCS Geismar, USA	Synthesis loop retrofit (brownfield)	2150 STPD	eB	Ongoing
Koch Enid, USA	Reformer furnace radiant section	1100 MTPD	E	2016
Koch, Beatrice, USA	Reformer furnace reharp & conv section	1100 MTPD	E	2016
Koch Ft. Dodge, USA	Reformer convection section revamp	1100 MTPD	E	2016
TOAZ, Togliatti, Russia	Capacity increase & energy reduction, seven	Incrémental 2200 MTPD	B, FEED [*]	Ongoing
PCS Trinidad, plant 1 & 2	Furnace reharp & transfer line	1600 MTPDx2	E/PEQ	2017
PCS Geismar, USA	Capacity increase - reforming exchanger	1600-2600 ST	eB, a, PEQ	Ongoing rescoped

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Mosaic, USA	Capacity increase & energy saving	1450-1800 ST	B, E, a	Ongoing
Fertial Annaba, Algeria	Capacity increase & energy saving	1000 to 1500	B, E, a, PEQ	Ongoing in FEED
Fertial, Arzew, Algeria	Capacity increase & energy saving	1000 to 1500	B, E, a, PEQ	Ongoing in FEED
Qatar Fertilizer Company (QAFCO) Ammonia 1&2	Capacity increase & energy saving- reforming	1150 to 1650 total 3300	FEED, a, PEQ [*]	Delivered 2016
Fatima Fertilizer, Pakistan	Purifier cold box supply	1800	E, PEQ	2015
Nitrogenmuvek, Hungary	Capacity & energy - reforming exchanger	1175 to 1650	B+PEQ	2016
SAFCO-IBB, KSA	Ammonia converter basket retrofit	1600	E+PEQ	2015
PCS N2, Lima, OH, USA	Capacity increase – reforming exchanger	1680 to 2140	B+E+ PEQ [*]	Online 2015
Agrium, Borger, TX, USA	Capacity increase, including furnace, RG	1300 to 1725	B+ EPC+ PEQ	In construction
Honeywell, Virginia, USA	Reformer furnace reharp	1900 STPD	E+PEQ	2014
Zuari, Goa, India	Capacity increase	850 to 1100	B [*]	Partly 2016
1st Global, Baiji, Iraq	Capacity increase	1000 to 1200	B	suspended
SABIC, Al Bayroni, KSA	Energy saving	1270	B	completed
CNC, Trinidad	Capacity increase	1850 to 2200	E	2015
Huajin, Kuche, China	Capacity increase	1,000 to 1,500	B [*]	2015
NFL, Nangal, India	Energy saving using Purifier	950	B [*]	2014
PakArab, Multan, Pakistan	Capacity & energy - reform exchanger	960 to 1400	B	Delivered 2012
KRIBHCO #1, Hazira, India	Capacity & energy using Purifier	1360 to 1890	B	2012
KRIBHCO #2, Hazira, India	Capacity & energy using Purifier	1360 to 1890	B	2012
Sabic, Al Bayroni, KSA	Primary reformer convection section	1270	B	2011
Sabic, Al Bayroni, KSA	Primary reformer auxiliary boiler	1270	B	2011
Fatima, Pakistan	Relocate plant from Holland	1500	B	2011
Zuari, Goa, India	Switch from naphtha to gas feed	750 to 1050	B [*]	2011
Yara, Tertre, Belgium	Primary reformer rebuild	908	E	2009

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Chambal #1, India	Capacity & energy - reform exchanger	1600 to 2000	B, Pa [*]	2009
Chambal 2, India	Capacity & energy – reform exchanger	1520 to 1940	B, Pa	2010
Daqing, China	Capacity increase	1,000 to 1,500	B, Pa, Ca	2006
Lutianhua, China	Capacity increase & energy decrease	1,000 to 1,500	B, Pa, Ca	2005
DSM, Galeen, Netherland	Ammonia converter basket retrofit	1500	Ea	2007
Shenzhen Liaohe Tongdo Chemicals, Liaoning, China	KRES retrofit & energy decrease	1,070	B, Pa	2003
Yuntianhua Group, China	Capacity increase & energy decrease	1,000 to 1,500	B, Pa, Ca	2002
PIM, Aceh, Indonesia	Radiant re-harp of primary reformer	1,400	E, Pa	2001
NCFC, Saudi Arabia	Capacity increase	1,500 to 1,750	B	2000
Kaltim, Bontang, Indonesia	Reformer revamp		E, P Ca	2000
Simplot Canada, Brandon, Manitoba, Canada	Reformer turnaround assistance		E, Pa, Ca	2000
PECOSA Cosoleacaque, Mexico	Radiant re-harp, BFW coil addition	4 x 1,450	E, Pa, Ca	1999
Terra Nitrogen, Unit 1 Verdigris, OK, US	Feed pre-heat coil replacement		E	1999
PCS N2, Geismar, LA, US.	Radiant re-harp and convection mods	1,630	E, Pa, Ca	1999
IMC-Agrico, St. James, LA, US.	Convection section modification and auxiliary	1,520	E, Pa	1998
Agrium Carseland, AB, Canada	Convection section replacement	1,800	E, Pa, Ca	1998
HIP Azotara Pancevo, Serbia	Radiant re-harp	1000	E	1998
PECOSA Cosoleacaque, Mexico	Energy savings, capacity increase	4 x 1,360 to 1450	B, bid book	1997
CF Industries Donaldsonville, LA, US	Revamp of four plants	910 to 1,475	B	1997
Yara, Trinidad	Capacity increase	680 to 880	E, P, Cm	1997
C.F. Industries Donaldsonville, LA, US	Reformer revamp	2 x 1,630	E, Pa, Ca	1997
Agrium Fort Saskatchewan, AB, Canada	Emergency radiant re-harp	1100	E, Pa	1997
C.F. Industries Donaldsonville, LA, US.	Reformer revamp	2 x 1,540	E, Pa, Ca	1997

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Fertiberia Huelva, Spain	Radiant reharp	1,400	E, Pa, Ca	1997
Yara, Sluiskil, The Netherlands	Capacity increase & reduced energy	910 to 1,100	E, P, Cm	1996
PCS N2, Augusta, GA, US	Capacity increase	1,360 to 1,800	E	1996
P. T. Pupuk Kalimantan Timur, Bontang, Indonesia	Capacity increase		E, Pa, Ca	1996
Incitec, Morningside, Queensland, Australia	Capacity increase, energy reduction, KAAP converter	587 to 800	B, P	1996
AMPRO Fertilizer Inc Donaldsonville, LA, US	Capacity increase, energy reduction, KAAP converter		E, P, C	1996
Sherritt Inc. Ft. Saskatchewan, Alberta,	Condensate stripper		E	1996
PCS N2, Memphis, TN, US	Secondary reformer waste heat boiler bundle		E	1996
Triad Donaldsonville, LA, US	Capacity increase	1,040 to 1,650	E, P, C	1996
Yara, Trinidad	As-built P&ID's & debottleneck		E,S	1996
JSC Cherepovets Cherepovets, Russia	Radiant reharp		E, Pa, Ca	1996
Diamond Shamrock Sunray, TX, US	Radiant reharp, 2 plants		E	1996
Ampro Donaldsonville, LA, US.	Hot leg convection section replacement	1,630	E, P, C	1996
Monsanto Chemical Luling, LA, US.	Reformer revamp		E, Ca	1995
Terra Nitrogen Port Neal, Iowa, US	Repair after accident		E, P, C	1995
P.T. Asean Aceh Fertilizer Lhokseumawe, Indonesia	Radiant reharp		E	1995
Farmland Ind. Various, US.	Reformer revamps for 7 units		E	1993-5
Ashland Chemical Plaquemine, LA, US	Radiant reharp	1,400+	E, Cm	1994
Canadian Fertilizer, Unit 1 Medicine Hat, AB, Canada	Reformer revamp		E	1994
Sherritt, Inc Fort Saskatchewan, Canada	Convection section revamp		E	1994
Koch Nitrogen, unit 1 Sterlington, LA, US	Reformer revamp	1,630	E, P, Ca	1994
Saudi Methanol, Unit 2 Al-Jubail, Saudi Arabia	Reformer revamp	1,000+	E, Ca	1994
Kribhco	Reformer revamp 2 units		E	1994

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Razi Chemical Complex Bandar Khomeini, Iran	Reformer revamp 2 units		E	1994
Ocelot Ammonia Company Kitimat, BC, Canada	Capacity increase, energy reduction, KRES system		E, P, Ca	1993
DSM AGRO B.V. Geleen, The Netherlands	Advanced control system (KDAC)		E, P	1993
P. T. Pupuk Kujang Cikampek, Indonesia	Optimization revamp	1,230	E, P, Ca	1993
P.T. Pupuk Iskandar Muda Lhokseumawe, Indonesia	Convection section modifications	1,170	E	1993
IFFCO Kalol, Gujarat, India	Reformer revamp		E, Ca	1993
LaRoche Ind. Cherokee, AL, US.	Reformer revamp	470	E	1993
AMC. Catoosa, OK, USA	Reformer revamp	1,360	E, Ca	1993
Fertrin, Trinidad	Radiant reharp	1,360	E, P, Cm	1993
Kemira, The Netherlands	Heat exchanger			1992
Ocelot Ammonia Company Kitimat, BC, Canada	Capacity increase, energy reduction, KAAP		E, P, C	1992
Koch Nitrogen, unit 2 Sterlington, LA, US	Reformer revamp	1,400	E, P, Ca	1992
AMC, Verdigris, OK, USA	Reformer revamp	1,360	E, P, Ca	1992
CFL, unit 2 Medicine Hat, AB, Canada	Reformer revamp	1,450	E, Ca	1992
Fertrin, Point Lisas, Trinidad	Plant revamp	1,360	E, P, Ca	1991
Farmland, Pollack, LA, USA	Advanced process control (KDAC)		E, P	1991
Sherritt Gordon, Ltd Canada	Reformer waste heat boiler (101-C)	1200	E	1994
Canadian Fertilizers Ltd Medicine Hat, Alberta, Canada	Reformer convection section revamp		E	1991
C.F. Industries Donaldsonville, LA, US.	Reformer revamp 2 units	1,540	E, Ca	1991
BP Chemicals, Lima, OH, US	Reformer waste heat boiler	1600	E	1990
Unocal Chemicals Kenai, Alaska, US	Converter replacement		E, P [*]	1990
Cominco. Borger, TX, US	Upgraded synloop waste heat boiler	1000	E, Pa	1990
AmproDonaldsonville, LA, US	Convection modifications	1,360	E, P, Ca	1990
Sherrit Gordon Fort Saskatchewan, Canada	Radiant reharp	1,360	E	1990

LEGEND

- B - Basic Engineering Design
- E - Engineering PEQ
- C - Construction Services
- eB - Extended Basic Engineering

- P - Procurement
- FEED - Front End Engineering
- PEQ - E/P of KBR
- M - Management

*Revamped non - KBR technology base plant

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