

# Secondary Reformer Waste Heat Boiler (101-CA/CB, 102-C) in Ammonia Plants

## BUSINESS CASE FOR WHB OFFERED BY KBR

1. Enhanced plant reliability
2. High on-stream factor
3. Improved shift conversion and reduced front-end pressure drop
4. Suitable for both grassroots and ammonia plant revamp
5. Smooth installation and easy maintenance
6. Commercially proven
  - Quantitative benefit data for specific vintage plant types available on request
  - Specific operating reference and case histories available to potential users

KBR's proprietary Waste Heat Boiler provides a reliable alternative to bayonet tube-type boilers in 150+ existing ammonia plants worldwide by offering the following distinct features:

1. Floating head design
  - Reduces stresses
  - Enhances tube life
2. Patented process gas Inlet distributor
  - Prevents localized heating
  - Minimizes fouling
  - Natural circulation type boiler, which eliminates the need for circulation pumps and improves reliability
  - Dual layer refractory-lined pressure shell with no metal liner, which allows for easy bundle removal
  - No internal, high temperature bypass valves, which are prone to failure – increases reliability

Waste Heat Boilers (WHB) in ammonia plants are subject to severe process conditions, and yet need to perform reliably for long periods between planned turnarounds. Failures lead to plant shutdowns, inefficient operations, suboptimal shift converters' catalyst operation, damage to shift catalyst, or damage to secondary reformer dome, which may require extensive and costly repair or replacement.

KBR's proprietary WHB design incorporates unique features based on extensive experience and know-how to avoid failures associated with thermal stress and severe process conditions.

## DESIGN FEATURES

**Vertical one-pass water-tube floating head mitigates the effects of thermal stress during high heat flux and harsh operating conditions**

Severe temperature swings during non-steady operating conditions can cause tube failures in WHB. KBR's WHB features a floating head design that allows the tube bundle to expand and contract more freely during drastic process temperature changes, reducing the effects of heat stress and enabling longer bundle life.

During planned turnarounds, the floating head and vertical water tube configuration allows for easier replacement of tube bundle when compared to a complete replacement required in horizontal fired-tube boilers with fixed tubesheets.

We now offer our proprietary, floating head design for the Reformed Gas Boiler (101C) for both grassroots plants and for replacement of 101-CA/CB-102-C in existing plants. The scheme for grassroots plants is illustrated in figure 1.

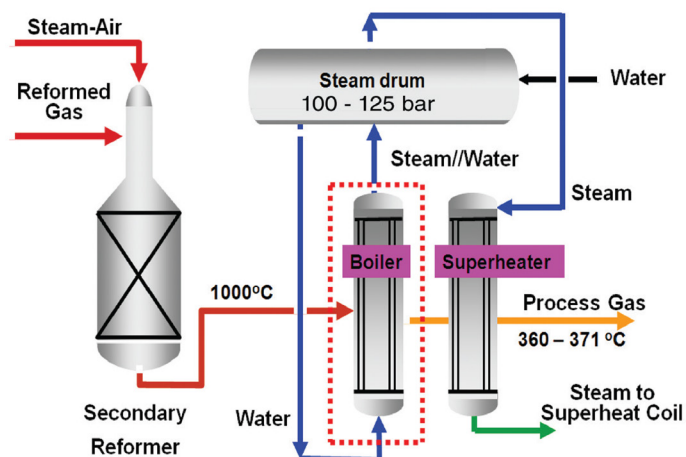


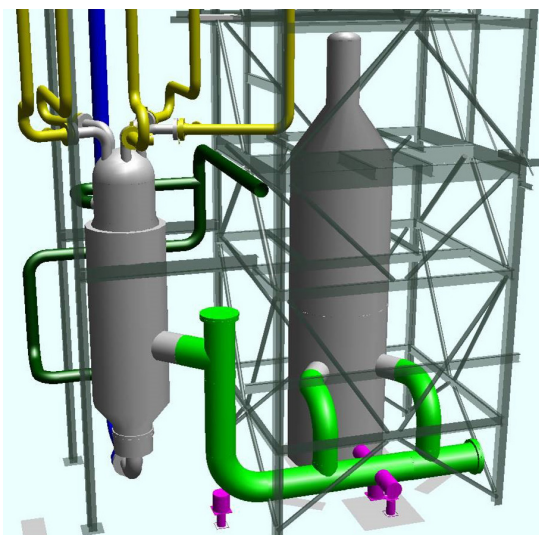
Figure 1: Reformed Gas Waste Heat Boiler

## Secondary Reformer Waste Heat Boiler (101-CA/CB, 102-C) in Ammonia Plants

### EASY INSTALLATION, LONGER OPERATING LIFE

KBR's WHB can be used in grassroot ammonia plants or as an upgrade in an existing ammonia plant.

For operating plants, it replaces three boilers: 101-CA, 101-CB and 102-C. Site installation can be carried out during regular plant operation, with minimum shutdown duration for final hook-up and commissioning. Tube bundles of these new boilers can be inspected during planned turnarounds as needed.



KBR's WHB technology solution is well proven in operating plants as a grassroots or retrofit option



Smooth installation and maintenance



Proven proprietary equipment installed worldwide for over 30 years



Proprietary internals ensure consistent performance

More than 150 operating vintage KBR ammonia plants worldwide presently use KBR's Bayonet type WHB design

KBR will perform a feasibility study, present the optimal solution, develop the design and deliver the exchanger as a single point of accountability. This approach reduces inefficiencies and errors brought about by multiple interfaces and reduces overall schedule.

This ensures smooth, trouble-free revamp project execution.

### IS REVAMPING RIGHT FOR MY PLANT?

Ideal candidates for a waste heat boiler revamp are:

- Kellogg Licensed plants built before 1988
- Plants operating with Bayonet-style boilers
- Plants seeking to minimize downtime resulting from plant upsets and damage to WHB system
- Plants that have had difficulties in removing/servicing their Bayonet boilers
- Plants seeking to upgrade existing, aging assets

[kbr.com](http://kbr.com)

Follow us on social media:



Contact us for more information:

[technology@kbr.com](mailto:technology@kbr.com)

