# ADVANCE™ CONSULT
## PROCESS

Stamicarbon's Plant Assessment that evaluates the opportunities to increase capacity and/or decrease operational costs and/or decrease emissions

The innovation & license company
of Maire Tecnimont.

Stamicarbon

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## PROCESS

When it comes to recognizing opportunities related to plant performance, a plant assessment is the essential starting point. It is only through a comprehensive analysis that Stamicarbon's engineers can determine the status of the plant and give advice on improvements.

**Stamicarbon's plant assessment, the ADVANCE CONSULT™ Process is of great value to your plant when you want to:**

- **Transform an operational bottleneck into a sustainable overall solution**
- **Analyze the plant status to determine the possibilities available to advance your plant**

To operate your plant at a sustainable and consistently high level, Stamicarbon provides expert advice on innovative processes and optimal equipment conditions for achieving high-quality outputs in the long term. Stamicarbon evaluates the feasibility of further improving plant performance, production and energy consumption by troubleshooting and optimizing process conditions.

Having analyzed the data, a bespoke model is put together offering an extensive overview of your plant's performance. This lays the foundation for the formation and implementation of creative improvements.

**Objectives:**

- Increase capacity
- Decrease emissions
- Decrease operational costs

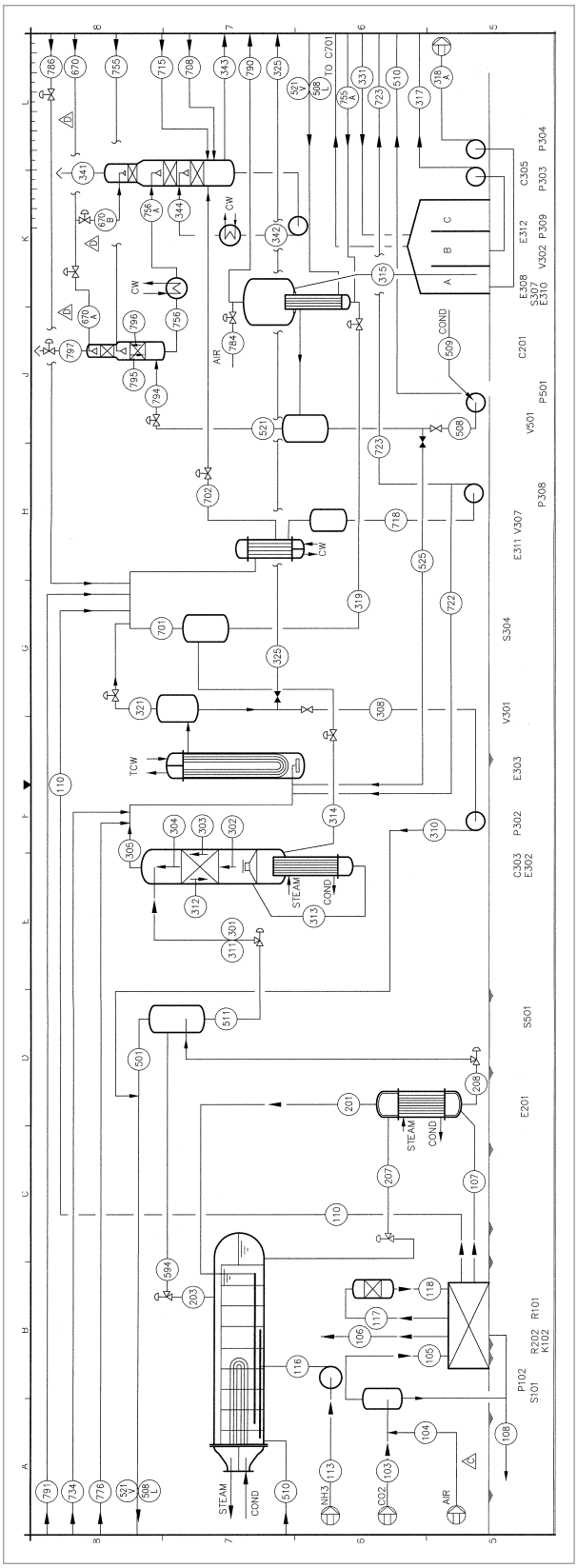
**The process includes:**

- Determining the current material balances
- Identifying sections operating at maximum load
- Identifying equipment which constantly operates close to design limits, needs replacement, or essential upgrades in the future
- Providing recommendations to rectify areas of concern (for example, LP steam venting)
- Advising how to improve your plant's performance including using proven debottlenecking concepts to take full advantage of all design margins so as to produce more urea and reduce emission figures.

**Figures of Mass Balance | Urea plant** Normal operation

| PROCESS STREAM | | $CO_2$ | NH3 | reactor outlet | Stripper outlet | Final product |
|---|---|---|---|---|---|---|
| Urea crystals | kg/h | - | - | - | - | 82279,0 |
| Urea | kg/h | - | - | 89989,6 | 83771,0 | - |
| Biuret | kg/h | - | - | 288,0 | 343,9 | 635,5 |
| $CO_2$ | kg/h | 62059,0 | - | 47799,1 | 16887,0 | - |
| $NH_3$ | kg/h | - | 46983,6 | 85565,2 | 13400,7 | 2,1 |
| $H_2O$ | kg/h | 2031,3 | 188,8 | 50968,4 | 41490,6 | 166,7 |
| $N_2$ | kg/h | 120,3 | 9,4 | - | 27,6 | - |
| $H_2$ | kg/h | 34,6 | 4,7 | - | - | - |
| $CH_4$ | kg/h | - | 14,2 | - | - | - |
| $O_2$ | kg/h | - | - | - | 7,8 | - |
| Formaldehyde | kg/h | - | - | - | - | 250,0 |
| **Total** | **kg/h** | **64245,3** | **47200,7** | **274610,3** | **155928,5** | **83333,3** |
| Temperature | °C | 40,0 | 30,0 | 182,4 | 173,0 | 60,0 |
| Pressure | bar | 1,01 | 17,7 | 141,2 | 144,2 | 1,01 |
| Density | kg/m³ | 1,624 | 595,9 | 975,3 | 1127, | 731,1 |
| Volume 1 | m³/h | 39568,1 | 79,2 | 281,6 | 138,3 | 114,0 |
| Volume 2 | Nm³/h | 34593,3 | - | - | - | - |
| Viscosity | mPa.s | 0,016 | 0,128 | 0,720 | 0,905 | - |
| Molecular weight | kg/kmol | 41,6 | 17,0 | 26,3 | 32,0 | 59,8 |
| Specific heat | kJ(kg.°C) | 0,906 | 4,894 | 5,361 | 4,988 | 1,758 |
| Compres. factor | - | 0,994 | - | - | - | - |
| Cp/Cv | - | 1,292 | - | - | - | - |
| Thermal conduct. | W/m.°K | 0,019 | 0,476 | 0,452 | 0,846 | 1,291 |
| Percentages (PPM where appropriate) | | | | | | |
| | **% by** | **mol** | **weight** | **weight** | **weight** | **weight** |
| Urea crystals | % | - | - | - | - | 98,7 |
| Urea | % | - | - | 32,8 | 53,7 | - |
| Biuret | % | - | - | 1049 ppm | 2205 ppm | 7626 ppm |
| $CO_2$ | % | 91,3 | - | 17,4 | 10,8 | - |
| $NH_3$ | % | - | 99,5 | 31,2 | 8,6 | 25 ppm |
| $H_2O$ | % | 7,3 | 4000 ppm | 18,6 | 26,6 | 2000 ppm |
| $N_2$ | % | 2781 ppm | 200 ppm | - | 177 ppm | - |
| $H_2$ | % | 1,1 | 100 ppm | - | - | - |
| $CH_4$ | % | - | 300 ppm | - | - | - |
| $O_2$ | % | - | - | - | 50 ppm | - |
| Formaldehyde | % | - | - | - | - | 3000 ppm |

## Example of a tailor-made process flow diagram



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