

PROVIDER OF

## Apps for Process Simulation

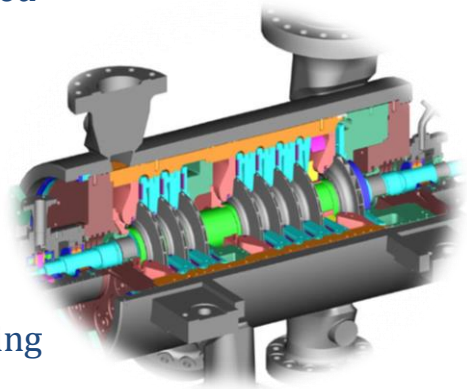
BPT software tools enhance the capabilities of your process simulation tools to improve your engineers efficiency and accuracy

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# BPT-CODES™

## Rigorous Centrifugal Compressor design and performance as part of your simulator

- Design an optimal compressor geometry based on physics and thermodynamics
- Life of Field evaluation of your compressor system
- Off design predictions for a selected design
- Adjusting to mapped curves allows monitoring field performance
- Maximize plant throughput and availability



### The bottom line

**Ensure an optimal compressor configuration early in the design phase. Avoid wasting energy during operations. Minimize emissions, assess re-bundling needs and avoid plant designs using excessive safety factors.**

**BPT CODES™ assists realistic and cost effective plant judgements in a minute.**

BPT was founded 1998 in Norway. We develop and provide Apps for Process Simulation™. We deliver independent and trusted third-party specialist consultancy services to the upstream oil & gas industry, combining experience with leading edge simulation tools using our Apps.

For additional information please contact us at  
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Registration and postal address:

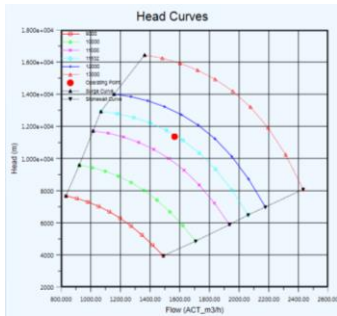
Billington Process Technology A/S  
Hiltonaasen 36, 1341 Slepden, Norway

## Generate Characteristic Curves

BPT-CODES™ (COmpressor DEsign and SIMulation) automatically generates performance maps for use within the process simulator.

BPT-CODES™ is a tool to develop a simulation model of a compressor based on classic design theories. The app can be used with high degree of confidence to predict the performance of a potential compressor, before any vendor data is available.

BPT-CODES™ generates separate curves for off design conditions for a selected geometry. Realistic performance maps become available for compressor assessments.



Compressor Design and Performance: op-100

Design Results

|                                    | 1                       | 2                       |
|------------------------------------|-------------------------|-------------------------|
| NI - Stage Index                   | 1                       | 2                       |
| R1 - Inlet Radius                  | 83.92 mm                | 83.92 mm                |
| BE1 - Inlet Width                  | 39.83 mm                | 30.75 mm                |
| R2 - Outlet Radius                 | 167.8 mm                | 167.8 mm                |
| BE - Outlet Width                  | 21.24 mm                | 17.59 mm                |
| BETA1 - Inflow Angle               | 61.98                   | 60.58                   |
| BETA2 - Outflow Angle              | 54.55                   | 54.55                   |
| NY - User Estimated Efficiency     | 0.8000                  | 0.8000                  |
| FC1 - Inlet RMS Flow Coefficient   | 0.5321                  | 0.5638                  |
| FC2 - Outlet Flow Coefficient      | 0.2525                  | 0.2525                  |
| NS - Specific Speed                | 0.7000                  | 0.6325                  |
| DS - Specific Diameter             | 4.000                   | 4.424                   |
| PT2 - Outlet Pressure              | 2754 kPa                | 3664 kPa                |
| RO2 - Outlet Mass Density          | 25.77 kg/m <sup>3</sup> | 31.12 kg/m <sup>3</sup> |
| TT2 - Outlet Temperature           | 66.64 C                 | 102.8 C                 |
| V2 - Outlet Velocity               | 165.1 m/s               | 165.1 m/s               |
| VR2 - Outlet Radial Velocity       | 60.15 m/s               | 60.15 m/s               |
| VT2 - Outlet Tangential Velocity   | 153.7 m/s               | 153.7 m/s               |
| WT2 - Relative Tangential Velocity | 84.49                   | 84.49                   |
| W2 - Relative Velocity             | 103.7                   | 103.7                   |
| M2 - Mach Number at Stage Outlet   | 0.4515                  | 0.4280                  |
| CP - Mass Specific Heat            | 1.040 kJ/kg.C           | 1.050 kJ/kg.C           |
| YAD - Head                         | 28.95 km                | 28.99 km                |

Connections Design **Design Results** Design I/O Performance About

Delete  Freeze Design Data  Ignore

Connections Design Design Results Design I/O Performance About

Design basis

Number of Impellers **6**  User defined diameter and speed  Constant Diameter  Fix Spec. Speed x Spec. Diameter to 2.8

| Impeller Number    | 1              | 2              | 3              | 4              | 5              | 6              |
|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Head Distribution  | 2659 m         | 2659 m         | 2659 m         | 2659 m         | 2659 m         | 2659 m         |
| Adiabatic Head     | 437.0 kcal/kg  | 437.0 kcal/kg  | 437.0 kcal/kg  | 437.0 kcal/kg  | 437.0 kcal/kg  | 437.0 kcal/kg  |
| Outlet Pressure    | 68.53 bar_g    | 84.20 bar_g    | 102.1 bar_g    | 122.2 bar_g    | 144.6 bar_g    | 169.3 bar_g    |
| Outlet temperature | 51.22 C        | 67.95 C        | 83.86 C        | 98.95 C        | 113.2 C        | 126.7 C        |
| Speed              | 2.306e+004 rpm | 2.306e+004 rpm | 2.306e+004 rpm | 2.306e+004 rpm | 2.306e+004 rpm | 2.306e+004 rpm |
| Diameter           | 338.8 mm       | 338.8 mm       | 338.8 mm       | 338.8 mm       | 338.8 mm       | 338.8 mm       |
| Outlet flow coeff. | 0.6318         | 0.6318         | 0.6318         | 0.6318         | 0.6318         | 0.6318         |
| Load Coefficient   | 0.2222         | 0.2224         | 0.2226         | 0.2228         | 0.2230         | 0.2231         |
| Specific Speed     | 1.000          | 0.9265         | 0.8643         | 0.8115         | 0.7664         | 0.7279         |
| Specific Diameter  | 6.000          | 6.473          | 6.936          | 7.385          | 7.816          | 8.226          |

Design Summary

OK

Load coefficient for stage 1 is below 0.5, this is too low. Consider decreasing speed  
Your speed for stage 1 is too high, reduce diameter or rpm

It is useful to check the “Freeze Design Data” checkbox (bottom right of the view) once you are done to avoid modifying the compressor design inadvertently.

After the curve generation is done, the interface will show the design parameters that can be used for a preliminary sizing of the compressor anti-surge valve. A button is available to install the compressor anti-surge controller with the parameters that define the surge line defined based on the curve that were generated for the compressor.

### References

#### Statoil

#### GDF Suez EPN

#### Total E&P Norge

#### Norsk Hydro

#### Linde engineering

#### Talisman

#### Dong

#### Åsgard Subsea Compression, Performance Models

#### Gjøa Conceptual and FEED compressor configuration study

#### Gjøa Operational support

#### Martin Linge - Compressor simulations

#### Oseberg C and Oseberg South compressor diagnosis

#### Snøhvit, Performance monitoring

#### Gyda - Gas Lift, Centrifugal compressor study

#### YME future – Conceptual study

#### Siri Platform - Compressor performance study

