

FMU Documentation: Engine_Speed_calc

Overview

- **FMI version:** 2.0
- **Generation tool:** Simulink (R2020a)
- **Generation date:** 13 Jan 2023 14:37:56 UTC
- **GUID:** {4921389d-d8ea-90dd-af5d-d0096e2c3f91}
- **Number of event indicators:** 0 (purely algebraic)

Default Experiment Settings

start time	stop time	suggested communication step
0 s	10 s	0.2 s

Interface Definition (*final*)

The uploaded Simulink model (`engine_speed_calc2.slx`) revealed the eight input ports and single output. Units have now been confirmed: **vessel speed in knots, drafts in metres**.

Inputs

#	variable name	type	unit	description
1	ves_speed	Real	kn	Vessel speed through water (knots)
2	draft	Real	m	Actual vessel draft
3	laden_draft	Real	m	Reference draft in laden condition
4	ballast_draft	Real	m	Reference draft in ballast condition
5	lamda1	Real	—	Empirical coefficient λ_1
6	beta1	Real	—	Empirical coefficient β_1
7	lamda2	Real	—	Empirical coefficient λ_2
8	beta2	Real	—	Empirical coefficient β_2

Outputs

variable name	type	unit	description
engine_speed_RPM	Real	rpm	Calculated main-engine speed

Units confirmed: vessel speed in **knots (kn)**; all drafts in **metres (m)**.

Independent Variable

name	type	unit	description
time	Real	s	Simulation time

Usage Notes

1. **Communication step** — The FMU was exported with a suggested Δt of **0.2 s**. Smaller steps (≤ 0.01 s) typically have no impact on this algebraic calculation.
2. **Input completeness** — Supply all eight inputs at each communication point; missing values will propagate NaN to the output.
3. **Thread safety** — The embedded DLL is single-threaded. Instantiate separate FMUs for parallel scenarios.
4. **Platform binaries** — Only a Win64 binary is present. Re-export for Linux/macOS hosts if necessary.

Example (Python + FMU)

```
from fmpy import simulate_fmu
import numpy as np

# 10-second run: vessel accelerates from 10 kn → 12 kn at fixed drafts
n = 21
T = np.linspace(0, 10, n)

inputs = {
    'ves_speed': np.column_stack([T, np.linspace(10, 12, n)]), # kn
    'draft': np.column_stack([T, np.full(n, 8.0)]), # m
    'laden_draft': np.column_stack([T, np.full(n, 9.0)]), # m
    'ballast_draft': np.column_stack([T, np.full(n, 6.0)]), # m
    'lamda1': np.column_stack([T, np.full(n, 0.85)]),
    'beta1': np.column_stack([T, np.full(n, 1.10)]),
    'lamda2': np.column_stack([T, np.full(n, 0.90)]),
    'beta2': np.column_stack([T, np.full(n, 1.05)])
}

result = simulate_fmu('engine_speed_calc2.fmu',
                     start_time=0.0,
                     stop_time=10.0,
```

```
step_size=0.1,  
input=inputs)
```

Updated 20 June 2025: units confirmed for vessel speed (knots) and drafts (metres).