VECTO 3.x
24.10.2016

Vehicle Energy Consumption Calculation Tool

Release Notes

Vecto 3.1.0.662
2016-10-24

- **Bugfixes**:
  - [VECTO-360] Fixed error during startup of VECTO (loading of DLLs).
  - [VECTO-358] Fixed errors during simulation where vehicle unintentionally was driving backwards. Fixed 1Hz-Filter for ModFiles (distance was wrong under certain circumstances, vehicle seemingly jumping back before halt)
  - [VECTO-361] Fixed classification of vehicles with GVM of exactly 7500kg
  - [VECTO-364] Fixed an error in measured speed mode (run aborts).
  - [VECTO-363] Compute shift polygons in declaration mode now uses correct boundary for full load margin.
  - [VECTO-365] Fixed editing gears in declaration mode

- **Improvements**:
  - [VECTO-355] User Manual updated (Screenshots, Descriptions, File Formats, Vecto V2 Comments removed).
  - [VECTO-317] Declaration data for Wheel sizes updated
  - [VECTO-359] Simplified code regarding PT1 behavior.
  - [VECTO-323] PTO-Cycle may now be left empty when not used in driving cycle.

Vecto 3.1.0.652
2016-10-14

- Main Updates
  - Removed VECTO Core 2.2
  - Refactoring of the User-Interface Backend: loading, saving files and validating user input uses Vecto 3 models
  - AT-Gearbox Model: differentiate between AT gearbox with serial torque converter and AT gearbox using powersplit
  - Numbering of gears with AT gearbox corresponds to mechanical gears, new column TC_locked in .vmod file to indicate if torque converter is active
  - Torque converter gear no longer allowed in input (added by Vecto depending on the AT model)
  - New implementation of torque converter model (analytic solutions)
  - Added PTO option for municipal utility vehicles: PTO idle losses, separate PTO cycle during standstill
  - Added Angledrive Component
  - Option for constant Auxiliary Power Demand in Job-File

Vecto 3.1.0.652
2016-10-14

- Main Updates (cont.)
  - Normalize x/y values before triangulating Delaunay map (transmission loss-maps, fuel consumption loss map)
  - Additional fuel consumption correction factor in declaration mode: cold/hot balancing factor
  - Added fuel consumption correction factor (WHTC, Cold/Hot balancing, …) in engineering mode
  - Update auxiliaries power demand according to latest whitebook
  - Allow multiple steered axles
  - Adapted engine idle controller (during declutch) – engine speed decreases faster
  - SUM-File: split E_axl_gbx into two columns, E_axl and E_gbx
  - New columns in mod-file: PTO, torque converter
  - Removed full-load curve per gear, only single value MaxTorque
  - Removed rims (dynamic wheel radius depends on wheel type)
  - Fixes in AAUX module: open correct file-browser, save selected files

Status quo VECTO software and open issues (Oct. 2016)
Next issues on the to do list

- **Further development of the AT model**
  Consideration of losses during power shifts, update of gear shift logics

- **Reimplementation of engine stop/start**

- **Declaration mode: implementation of EMS vehicle configurations**

Items waiting for decision on methods and resources:

- **Update engine data (according to update of Annex II)**
  Other fuels than diesel, "top torque" feature, correction factor for periodic regerating DPFs

- **Declaration mode:**
  - **Revision of calculated vehicle loads**
  - **implementation of refuse cycle (instead "municipal")**
    Update of driving cycle, consideration of generic PTO loads during collection part, generic body weight and payload
  - **VECTO output (approval authorities, customer info, monitoring)**
  - **Buses**

- **Predictive ADAS**

VECTO Release Notes

Vecto 3.0.4.565
2016-07-19

- Bugfixes

    - AAUX HVAC Dialog does not store path to ActuationsMap and SSMSource

    - GUI: check for axle loads in declaration mode renders editing dialog useless

    - Vecto 2.2: Simulation aborts (Vecto terminates) when simulating EngineOnly cycles

    - Vecto 3: Building SimulationRun EngineOnly simulation failed

Vecto 3.0.4.544
2016-06-28

- Main Updates
  - New gear shift strategy according to White Book 2016
  - New coasting strategy according to White Book 2016
  - New input parameters (enineering mode) for coasting and gear shift behavior
  - Use SI units in Advanced Auxiliaries Module and compile with strict compiler settings (no implicit casts, etc.)
  - Allow efficiency for transmission losses (in engineering mode)

- Bugfixes
  - Auxiliary TechList not read from JSON input data
  - Improvements in driver strategy
  - Bugfixes in MeasuredSpeed mode

Notes for using Vecto 3.x with AAUX (1)

- The AdvancedAuxiliaries module requires the number of activations for pneumatic consumers (brakes, doors, kneeling) and the (estimated) total cycle time. This can be configured in the .APAC-file (actuations file). For standard bus/coach cycles (i.e., the cycle file contains "bus" **and** "heavy_urban" or "suburban" or "interurban" or "urban"; **or** the cycle contains "coach" (*case insensitive*)) the actuations file already contains the number of activations and the cycle time. For other cycles the filename without extension is used to lookup the activations in the .APAC file (*case sensitive*)

Notes for using Vecto 3.x with AAUX (2)

- Vecto 3 uses an average auxiliaries load (determined by the AAUX module depending on the settings) for the simulation. The AAUX module computes the fuel consumption in parallel to VectoCore and accounts for smart consumers (e.g., alternator, pneumatics, …).

- Output
    - The .vmod file contains both, the fuel consumption calculated by VectoCore (per simulation interval) and AAUX (accumulated and per simulation interval). Columns in .vmod file:
        - AA_TotalCycleFC_Grams [g]: accumulated fuel consumption as computed by the AAUX model, considering smart consumers
        - FC-Map [g/h]: fuel consumption as computed by VectoCore interpolating in the FC-Map, using an average base load of auxiliaries
        - FC-AUXc [g/h]: fuel consumption corrected due to engine stop/start (currently not applicable)
        - FC-WHTCc [g/h]: WHTC-corrected fuel consumption (not applicable in engineering mode)
        - FC-AAUX [g/h]: fuel consumption per simulation interval, derived from AA_TotalCycleFC_Grams
        - FC-Final [g/h]: final fuel consumption value with all (applicable) corrections applied (stop/start, WHTC, smart auxiliaries)

Notes for using Vecto 3.x with AAUX (3)

- Output .vsum

  - Columns in .vsum file:

    - FC-Map: total fuel consumption as computed by VectoCore interpolating in the FC-Map, using an average base load of auxiliaries

    - FC-AUXc: total fuel consumption corrected due to engine stop/start (currently not applicable)

    - FC-WHTCc: WHTC-corrected fuel consumption (not applicable in engineering mode)

    - FC-AAUX: fuel consumption per simulation interval, derived from AA_TotalCycleFC_Grams

    - FC-Final: final fuel consumption value with all (applicable) corrections applied (stop/start, WHTC, smart auxiliaries)

Vecto 3.0.3.537
2016-06-21

- Main Updates
  - Plot shift lines as computed according to WB 2016 declaration mode in GUI

- Bugfixes
  - GUI: Buttons to add/remove auxiliaries are visible again
  - Error in calculation of WHTC correction factor
  - Fix: consider gearbox inertia (engineering mode) for searching operating point
  - Wrong output of road gradient in measured speed mode (correct gradient for simulation)
  - Fuel consumption in .vsum file now accounts for AdvancedAuxiliaries model
  - GraphDrawer (Vecto): handle new .vmod format of Vecto 3
  - AdvancedAuxiliaries: language-settings independent input parsing
  - Paux was ignored when running Vecto 2.2
  - Error in massive multithreaded execution
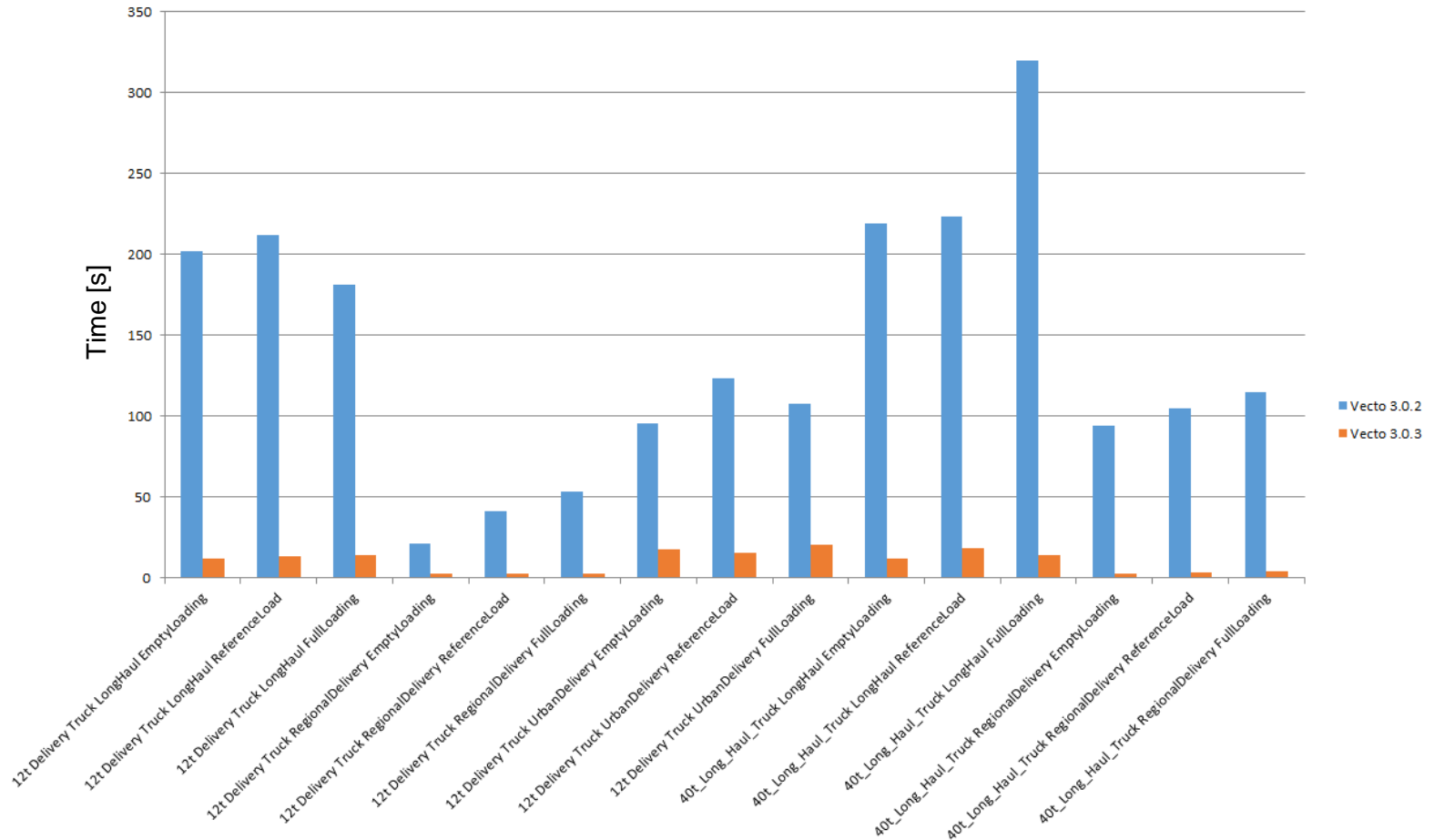 - Fix unhandled response during simulation
  - Fix output columns in .vmod

Vecto 3.0.3.495
2016-05-10

- Main Updates
  - Support for Advanced Auxiliaries (Ricardo) in Vecto 3.0.3 and Vecto 2.2
  - Performance improvements
  - Gearshift polygons according to WB 2016
  - Revision of SUM-data file, changed order of columns, changed column headers

- Bugfixes
  - Delaunay Maps: additional check for duplicate input points
  - Creation of PDF Report when running multiple jobs at once
  - Sanity checks for gear shift lines
  - Improvements DriverStrategy: handling special cases

Performance Comparison

Execution Times (all 15 runs in parallel)

Total execution time (15 runs in parallel): Vecto 3.0.2: 6min 6s; **Vecto 3.0.3: 35s**

VECTO 3.0.2
2016-03-11

Main updates

- New simulation modes:
  - Pwheel (SiCo),
  - Measured Speed (with/without gear)
  - v_air/beta cross-wind correction (vcdb)

- Adaptations of powertrain components architecture
  - Move wheels inertia from vehicle to wheels
  - Auxiliaries no longer connected via clutch to the engine but via a separate port
  - Engine checks overload of gearbox and engine overload

- Fixed some driving behavior related issues in VectoCore:
  - When the vehicle comes to a halt during gear shift, instead of aborting the cycle, it tries to drive away again with an appropriate gear.

- ModData Format changed for better information and clarity

- Added validation of input values (according to latest VectoInputParameters.xls)

- Various bugfixes

Pwheel (SiCo) Mode

- Function as already available in Vecto 2.2 also added in Vecto 3.0.2
  - Driving cycle specifies power at wheel, engine speed, gear, and auxiliary power
  - No driver model in the simulation.
  - The Vecto gear-shift model is overruled.
  - Function used for creating reference results for SiCo tests
  - For details see user manual: Simulation Models / Pwheel Input (SiCo)

Measured Speed Mode

- Functionality already available in Vecto 2.2 added in Vecto 3.0.2
    - Driving cycle not defined by target speed but by actual speed. No driver model in the simulation.
    - Gear and engine speed can be specified in the driving cycle. In this case the Vecto gear-shift model is overruled.
    - Function used for "proof of concept" purposes
    - For details see user manual: Calculation Modes / Engineering Mode / Measured Speed

.vmod File Update

- In Vecto 3.0.2 the structure of the modal data output has been revised and re-structured. Basicaly for every powertrain component the .vmod file contains the power at the input shaft and the individual power losses for every component. For the engine the power, torque and engine speed at the output shaft is given along with the internal power and torque used for computing the fuel consumption.

- For details see the user manual: Input and Output / Modal Results (.vmod)

Changelog 3.0.2

- - New simulation modes:
-    + Measured Speed
-    + Measured Speed with Gear
-    + Pwheel (SiCo)
- - Adaptations of powertrain components architecture
-    + Move wheels inertia from vehicle to wheels
-    + Auxiliaries no longer connected via clutch to the engine but via a separate port
-    + Engine checks overload of gearbox and engine overload
- - Fixed some driving behavior related issues in VectoCore:
-    + When the vehicle comes to a halt during gear shift, instead of aborting the cycle, it tries to drive away again with an appropriate gear.
- - [ModData Format](#modal-results-.vmod) changed for better information and clarity
- - Entries in the sum-file are sorted in the same way as in Vecto 2.2
- - In engineering mode the execution mode (distance-based, time-based measured speed, time-based measured speed with gear, engine only) are detected based on the cycle
- - Added validation of input values
- - Gravity constant set to 9.80665 (NIST standard acceleration for gravity)
- - Improved input data handling: sort input values of full-load curves (engine, gbx, retarder)
- - Better Integration of VectoCore into GUI (Notifications and Messages)
- - v_air/beta cross-wind correction (vcdb) impemented
- - For all calculations the averaged values of the current simulation step are used for interpolations in loss-maps.
- - Allow extrapolation of loss maps in engineering mode (warnings)
- - Refactoring of input data handling: separate InputDataProvider interfaces for model data
- - Refactoring of result handling: separate result container and output writer
- - New Long-Haul driving cycle included
- - User Manual updated for VECTO V3.x
- - Fix: sparse representation of declaration cycles had some missing entries
- - Bugfix: error in computation of engine's preferred speed
- - Bugfix: wrong vehicle class lookup
- - Bugfix: duplicate entries in intersected full-load curves
- - Bugfix: retarder takes the retarder ratio into account for lossmap lookup
- - Bugfix: use unique identifier for jobs in job list
- - Bugfix: error in triagulation of fuel consumption map

VECTO Release Notes