VI-MotorCycle 19.0 Release Notes

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Table of Contents

1 Release Notes

Welcome to the release notes of VI-MotorCycle 19.0. The chapter contains information regarding new features, known issues and update history.

Please send your comments or support requests to support@vi-grade.com.

Note: All instruction in this guide applies to all supported Adams versions, see Platform Support for further info.

1.1 What's New

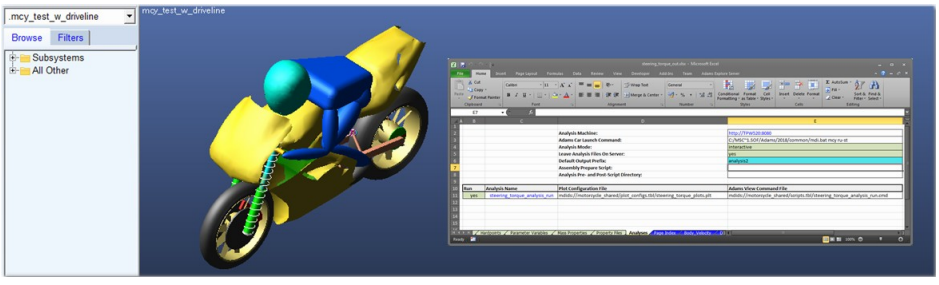
What's new in version 2018.19.0:

- What's new in VI-MotorCycle

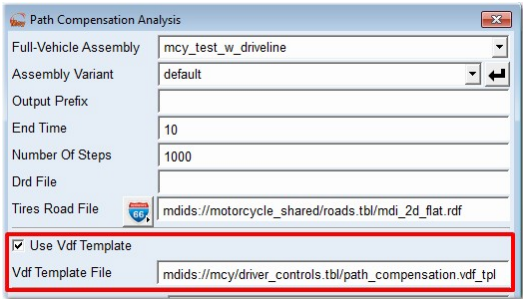
1.1.1 What's New in VI-MotorCycle

This VI-MotorCycle release has the following new or enhanced modeling and simulation capabilities:

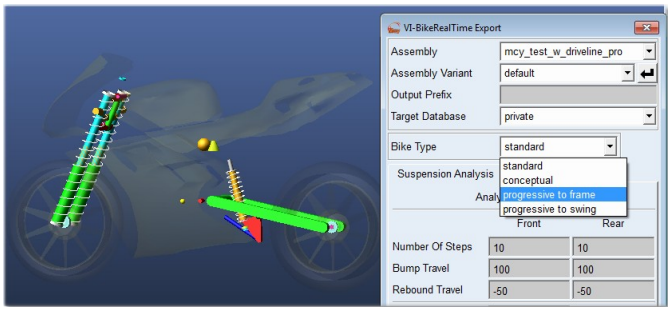
- Adams Explore support: VI-MotorCycle can integrate Adams Explore plug-in, so that the user can rely on Explore facilities to submit jobs using a VI-MotorCycle bike model. A tutorial which explains how to use Adams Explore in VI-MotorCycle is provided.



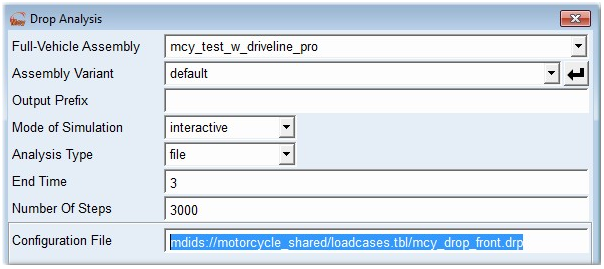
- Path Compensation event supports vdf_template: the user has the possibility to submit a path compensation analysis using a vdf template in which he can define his own custom settings for VI-Rider.



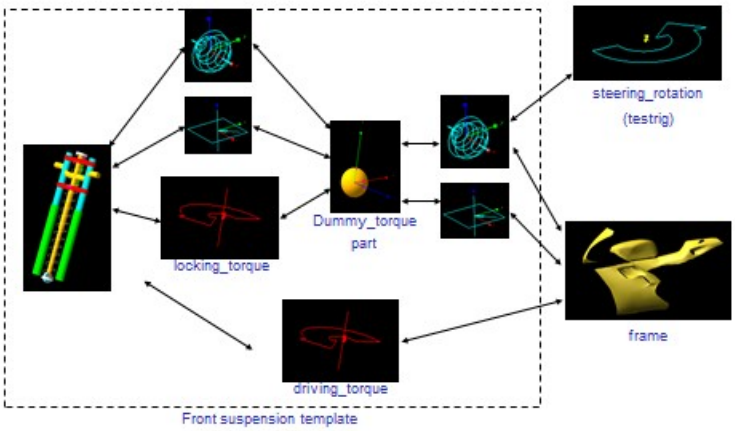
- Support new rear suspension layouts in VI-BikeRealTime export tool: the procedure is now able to recognize *progressive to link* and *progressive to swingarm* rear suspension layout and it automatically generates a VI-BikeRealTime model using such suspension.



- Actuate drop testrig with an input loadcase file: it's now possible to submit a drop testrig simulation by issuing a specific loadcase file (*.drp extension). An example is shipped with mcy_shared database.



- New Advanced Steering Joint UDE: introducing a new steering joint UDE which supports two attachments (upper and lower) between the front suspension and the frame. It's recommended whenever the fork to frame connection is modeled with flexible bodies.



- Assembly variant support: VI-MotorCycle inherits and supports assembly variant feature. An assembly example with variants is shipped with mcy_shared database.

VI-MotorCycle 19 is based on **Adams 2018.0**.

Please refer to the revision history table for a summary of the addressed issues strictly related to VI-MotorCycle and to the Adams release notes document for improvements related to the Adams infrastructure.

1.2 Licenses

VI-MotorCycle 19.0 requires the following set of license keys:

- *VI_MotorCycle_ADAMS_IFace*
- *VI_MotorCycle_Core*
- *VI_Road_Core*
- *VI_Road_Toolkit*
- *VI_Tire_Core*
- *VI_Tire_Toolkit*
- *VI_Tire_TireLimits*
- *VI_Rider_Basic_Core*
- *VI_Driver_EventBuilder*
- *VI_MotorCycle_PressManeuver*

The interface to VI-BikeRealTime and the VI-BikeRealTime standalone solvers require the following two specific licenses:

- *VI_Bike_ADAMS_IFace*
- *VI_Bike_Core*

when the VI_Bike_ADAMS_IFace key is not available the export functionality will be disabled.

Please make sure that you are running VI-grade Licensing version 19.0 or newer (based on LMX server version 4.8.7 or newer).

As software prerequisite an Adams supported version installation is required. The Adams licenses required are:

- *ADAMS_View*
- *ADAMS_Solver*

The Weave & Wobble analysis mode requires to run the Adams/Linear module which requires the license key:

- *ADAMS_Linear*

This product is in part based on incorporated software libraries. Please refer to the acknowledgments.pdf document, included in the product documentation for a listing of the adopted components and the respective licenses.

1.3 3rd Party Compatibility

This table shows the compatibility of the VI-grade suite products with the main 3rd party software.

	VI-CarRealTime	VI-BikeRealTime	VI-DriveSim	VI-Driver/VI-Rider for Matlab	VI-Driver for FMI
Matlab®	from 2015b to 2018b	from 2015b to 2018b	from 2015b to 2018b*	from 2015b to 2018b	
Veristand™ (***)	2015sp1	2015sp1			
dSPACE® RCP & HIL (**)	2014b-2017a	2014b,2017a		2015b-2017a	
SimWorkBench®	2018.3 2017.3	2018.3	2018.3 2017.3		
xPC®	2012b				
Dymola®	2015				2015
CarSim™	8.1.1, 9.0				
Virtual Test Drive®	1.4				
Prescan®	7.3				
SCANeR®	1.7r37, 1.8r33		1.7r37, 1.8r33		
ETAS LABCAR-OPERATOR IP®	5.4.0				
SolidThinking Activate	2017.1				
TameTire	5.1		5.1		
CDTire	4.2		4.2		
adheRide thermoRide	1.2/1.4				

(*): please refer to SimulationWorkBench documentation for Matlab version compatible with MLToolkit module.
(**): for SCALEXIO targets, only firmware version 4.0.1 is supported.

3rd Party Software included in VI-grade products:

	VI-CarRealTime	VI-BikeRealTime	VI-DriveSim	VI-Driver/VI-Rider for Matlab	VI-Driver for FMI
FTire	2019-1		2019-1		
MF-Tyre/MF-Swift	6.2.0.3 7.3	6.2.0.3 7.3	6.2.0.3 7.3		

The following table shows the 3rd party compatibility for Adams-based VI-grade product:

	VI-Motorcycle	VI-Automotive	VI-Rail	VI-Aircraft	VI-CarRealTim Plug-In	VI-Driver
MSC Adams™	2018.0	2018.0	2018.0	2018.0	2017, 2017.1, 2017.2, 2018.0	2017, 2017.1, 2017.2, 2018.0
Matlab®	*	*	*	*		

(*): please refer to Adams documentation for compatibility version.
(***) The NI-PXI integration requires Visual C++ 2010 / SDK 7.1 to complete the building procedure successfully. Please refer to the NI-VeriStand documentation for more detail.

The VI-Licensing LMX supported version is **4.8.7** both for Server and for Client.

1.4 System Requirements

Supported Operating Systems

VI-MotorCycle 19.0 is available for the following Adams versions:

Adams version	Platform	Installer Name
Adams 2018	windows x64	VI_Motorcycle_2018_19_0_x64_Setup.exe

This installer is compatible with:
- Windows 7 x64
- Windows 10 x64

Please refer to Adams 2018 platform & product section for the supported operating systems.

Note: make sure you get the correct architecture (64 bit) for 3rd party tools, like MATLAB.

Hardware Requirements

Please refer to Adams System Requirements section for all the Hardware Requirements.

VI-MotorCycle full package installation needs at least:
- 350 MB of hard disk space for VI-MotorCycle
- 150 MB of hard disk space for VI-EventBuilder
- 100 MB of hard disk space for VI-Road

1.5 Updating Models

1.5.1 Updating to 2018.19.0

An automatic conversion procedure will update the content of your v18 templates making them compliant to the v19 requirements.

1.5.2 Updating from previous versions

Updating to 2017.18.0

The following key in the VDF file is now affecting also OPENLOOP throttle signal while in past version only MACHINE mode was affected: **THROTTLE_CONTROL_ACTIVATION = 'TRUE'**

The consequence is that during a gearshift, the throttle will be released also when configured in open loop mode.

Updating to 2015r1.17.0

An automatic conversion procedure will update the content of your v16 templates making them compliant to the v17 requirements with the following exception:

- **front suspension templates**
  The v17 version includes a new luggage template. Since one of the luggage part (front bag) attaches to the front suspension upper part, all the distributed front suspension templates defines a new communicator with the following properties:

Name	Class	Minor Role	Matching name
cos_suspension_upper_mount	mount	inherit	suspension_upper_mount

If you are using a custom front suspension template and you plan to use it with the _luggage template, please make sure to add a communicator compliant with the specifications above.

Updating to 2013r2.16.0

An automatic conversion procedure will update the content of your v15 templates making them compliant to the v16 requirements with the following exceptions:

- **_frame_test template**
  up to v15 the shared frame_test.tpl included an output communicator of type location called *cos_engine_mount*. the definition of such communicator is wrong since the location is not actually parameterized on reference frame. This condition makes the communicator useless and an attempt to modify the element may lead to an application crash.
  The problem has been corrected in v16 version of the frame_test template removing entirely the *cos_engine_mount* communicator and adding a new hard point directly in the powertrain_test model.

- **_powertrain_test template**

The v16 version of the suspension testrig is compatible with extended suspension assemblies including the frame and/or the powertrain templates. When both are included the testrig is connected to the powertrain element using a new communicator with the following properties:

Name	Class	Minor Role	Matching name
cos_powertrain	mount	inherit	powertrain

If you are using a custom powertrain template and you plan to use it with the suspension testrig, please make sure to add a communicator compliant with the specifications above.

Updating to 2013.15.0

An automatic conversion procedure will update the content of your v13 templates making them compliant to the v15 requirements.

The conversion process does not cover the migration from the former _rider_test template to the new _parametric_rider one. If you want to benefit of the new template in your models, please create a new subsystem file for the template and replace your existing rider subsystem in your assemblies.

Updating to 2010.13.0

The conversion process from v2008r1.12.0 to v2010.13.0 or from v2008r1.12.0 to v2008.13.0 is completely automatic.

Note: You can load a model saved in a 2008.13.0 version into a 2010.13.0 one, but you cannot load a model saved in a 2010.13.0 into a 2008.13.0.

Updating to 2008r1.12.0

This version of VI-MotorCycle is extensively using the latest VI-Rider implementation for all the supported full vehicle events, but requires to assemble your model with the __MCY_VIRIDER_TESTRIG instead of the older __MCY_RIDER_TESTRIG. The latter is still provided for legacy support (it allows to run SDF based analyses). It is strongly recommended to switch to the new testrig to take advantage of the improvements made to the rider technology.

Loading a v11.0 assembly based on the __MCY_VIRIDER_TESTRIG, the following set of warnings will be reported:

```
WARNING: ------------------------------------------------
WARNING: Hardpoint body was not found in template __MCY_VIRIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter sen_off_road_active was not found in template __MCY_VIRIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter sen_road_end_active was not found in template __MCY_VIRIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter Steer_Torque_active was not found in template __MCY_VIRIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter kickdown_control_active was not found in template __MCY_VIRIDER_TESTRIG
```

All of them could be disregarded.

Several templates of the shared database have been reviewed improving their layout and naming convention

for parameters. Here is a list of changes:

- Removed the parameter pvs_max_brake_value from 2d/3d brake templates (_2D_brake_system.tpl and _3D_brake_system.tpl)

```
 ! WARNING: ------------------------------------------------
 ! WARNING: Parameter max_brake_value was not found in template mdids://
motorcycle_shared/templates.tbl/_2D_brake_system.tpl
```

  Such parameter was not used so this change has no effects for the final user

- Removed unused aerodynamic parameters from body templates. These elements were not used by the shared model because only aerodynamic drag force is (and was) implemented:

```
! WARNING: ------------------------------------------------
! WARNING: Parameter Clift was not found in template mdids://motorcycle_shared/
templates.tbl/_frame_test.tpl
! WARNING: ------------------------------------------------
! WARNING: Parameter Cy_moment was not found in template mdids://motorcycle_shared/
templates.tbl/_frame_test.tpl
! WARNING: ------------------------------------------------
! WARNING: Parameter Cz_moment was not found in template mdids://motorcycle_shared/
templates.tbl/_frame_test.tpl
```

- The current _frame_test.tpl is no more including geometries, all of them have been moved into a specific body_geometry template. Using this approach the model appearance could be easily customized reworking an almost empty template including only geomteries. Please note that models based on the shared _frame_test.tpl requires to be updated to include the _mcy_body_geomtetry.tpl or _scooter_v3_body_geometry.tpl to get body geometries shown. In addition the pvs_naked parameter has been removed from the shared body template since all the body geometries are now stored into a specific template.

```
! WARNING: ------------------------------------------------
! WARNING: Parameter naked was not found in template mdids://motorcycle_shared/
templates.tbl/_frame_test.tpl
```

- The _powertrain_flywheel.tpl does not include anymore the pvs_max_throttle parameter and the hardpoint engine_cm_loc has been renamed to engine_to_swingarm

```
 ! WARNING: ------------------------------------------------
 ! WARNING: Hardpoint engine_cm_loc was not found in template mdids://
motorcycle_shared/templates.tbl/_powertrain_flywheel.tpl

 ! WARNING: ------------------------------------------------
 ! WARNING: Parameter max_throttle was not found in template mdids://
motorcycle_shared/templates.tbl/_powertrain_flywheel.tpl
```

  Note: if you are using this template in one of your subsystem, please remember to update the subsystem data for the new hardpoint location

- Powertrain part in _powertrain_flywheel.tpl is now user defined so its origin could be assigned at subsystem level.
- The ges_rider part in the _rider_test.tpl has been modified to use the existing cfs_rider_reference construction frame as part origin (previously an hardcoded offset of -30, 0, 500 mm was defined).

  Note: if you are using this template in your subsystem please remember to update the center of mass location of the ges_rider part adding the offset to the existing coordinates.

- Chain template (_driveline_w_chain_effect.tpl) has been upgraded to include:
  1. preload support (belt mode)
  2. slack input (chain extra length)
  3. symmetric chain tensioning.

  Please refer to the Driveline template description for a mathermatical description of the new model. User templates referencing the chain model subroutines (gfosub vitools::vmc_chaingfo) are automaticaly upgraded to the latest implementation.

  Note: The definition of chain stiffness and damping have been changed to properly depends on the chain length respect v11.0. In order to obtain the same behaviour of v11.0 the stiffness and and damping parameters needs to the updated as follow:

$$newStiffness = oldStiffness \cdot (L_0)^2$$
$$newDamping = oldDamping \cdot (L_0)^2$$
$$L_0 = \text{chain design reference length (typically } \cong 0.6\text{m)}$$

- New version of shared templates:
  front suspension --> new template with specific adjustments and settings
  rear suspension --> new template with cleaned out layout

Some changes may also be required for VDF files generated by v11.0:

- The end condition `DISTANCE` is not more valid in VDF file and should be replaced with one of the following:
  - `PATH_S`
  - `TRAVELLED_DISTANCE`
  - `GLOBAL_TRAVELLED_DISTANCE`

  where v11 DISTANCE is equivalent to PATH_S

- The latest version of VI-Rider come with new default settings. In order restore v11 behaviour please add the following keys to the STEERING_STANDARD block:

```
[STEERING_STANDARD]
MODEL = 'STANDARD'
PID_YAWRATE_PROP_GAIN = 1
PID_YAWRATE_INTG_GAIN = 0.01
FRONT_TIRE_LATSLIP_CUTFREQ = 3
FINAL_FILTER_ACTIVE = 'FALSE'
```

Updating to 2005r2.11.0

In order to run a model created in VI-MotorCycle 2005r2.10.0 in this version, no manual conversion operations are required unless the user is interested in taking advantage of the new software capabilities. In particular the powertrain templates included in the shared database has been improved to support:

1. de-activable flywheel part for simulating engine gyroscopic effects
2. run time omega initialization (based on the rotating part component)

As a consequence of point 1, the existing _scooter_powertrain template has been removed from the shared

database since the updated _powertrain_flywheel template could work with both flywheel active or not.

Assemblies based on older powertrain templates are still supported, but in this condition only the design time initialization of the engine initial states is supported (same as in the previous VI-MotorCycle version). The run time initialization of the rotating parts omega is instead not supported using old models not including a proper set of Rotating Part UDEs.

Please refer to the link _powertrain_test.tpl for a comparison of the old vs new version of the powertrain template. Similar changes have been introduced in all the shared powertrain models.

In order to use the new VI-Rider controller (VDF based), new assemblies should be generated using the __MCY_VIRIDER_TESTRIG. The existing subsystems are compatible with the new testrig.

Updating to 2005r2.10.0

The default unit system for VI-MotorCycle is now MMKS. The user could select to restore the previous default (MKS) adding the following environment variable to his own .acar.cfg file:

```
ENVIRONMENT   VI_UNITS_SETTING MKS
```

In order to support multiple units system the following templates of the motorcycle shared database has been modified respect to v2005r2.1.5:

- **All Body templates**: a unit conversion factor has been added (ucf_gc variable) in order to properly convert the drag force to newton in both MKS and MMKS units. The new expression of the drag torque now looks like this:

```
variable create  &
   variable_name =  ._frame_test.ucf_gc  &
   real_value = (1(m) * 1(kg) / 1(N) / 1(s) / 1(s)) &
   units="length"

force modify direct general_force  &
   general_force_name = ._frame_test.aero_forces  &
   x_force_function= "0.5*step(aryval(._frame_test.drag_filter_y,1),0,", &
                     "._frame_test.pvs_Cdrag,100,._frame_test.pvs_CDrag_brake)", &
                     "*._frame_test.pvs_air_density*",  &
                     "._frame_test.pvs_frontal_area*", &
                     "VARVAL(._frame_test.gyro_VX)**2", &
                     "/(._frame_test.ucf_gc)"
```

- **All Powertrain templates**: a units conversion factor has been added (ucf_gc variable) in order to properly compute the engine acceleration in the different units system.

```
variable create  &
   variable_name = ._powertrain_test.ucf_gc  &
   real_value = (1(m) * 1(kg) / 1(N) / 1(s) / 1(s)) &
   units="length"

variable modify  &
   variable_name = ._powertrain_test.engine_rotational_inertia  &
   real_value=((._powertrain_test.pvs_iner_crank+
               ._powertrain_test.pvs_iner_clutch/._powertrain_test.pvs_I_p_ratio**2 +
               ._powertrain_test.pvs_iner_acg/._powertrain_test.pvs_I_acg_ratio**2)
               / ._powertrain_test.ucf_gc)
```

Added missing units declaration to clutch stiffness and damping parameter variable for scooter powertrains:

```
variable create  &
   variable_name = ._scooter_powertrain.pvs_clutch_stiffness  &
   units = "torsion_stiffness"  &
   real_value = 100.0
!
variable create  &
   variable_name = ._scooter_powertrain.pvs_clutch_damping  &
   units = "torsion_damping"  &
   real_value = 50.0
```

- **_scooter_v3_front_susp**: fixed units declarations for geometrical constant (construction frames location delta).

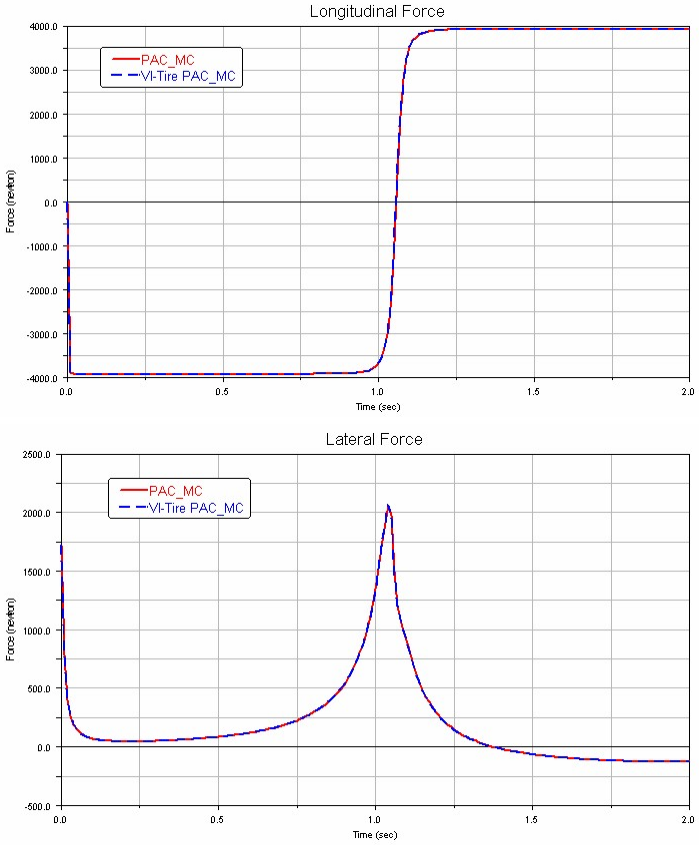
In case of MKS units, no changes to the model are required.

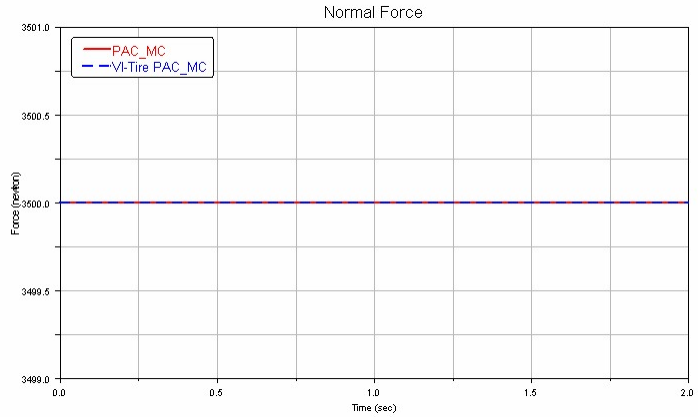
VI-MotorCycle 2005r2.10.0 release use VI-Tire PAC_MC as standard tire model. Property files belonging to previous PAC_MC formulation will be automatically converted to the new routines.

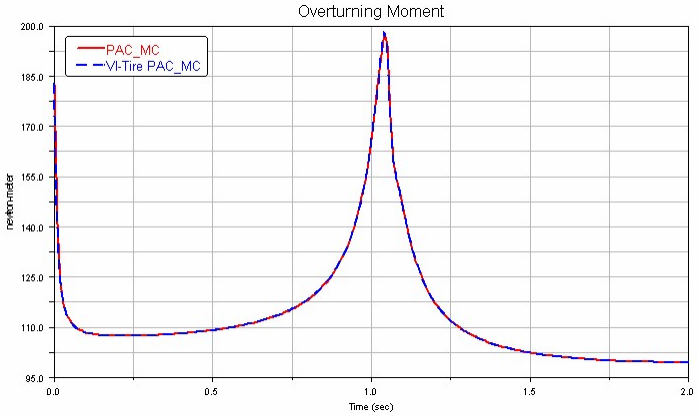
In order to address the VI-Tire subroutines the tire property file should include the following lines in the MODEL block:

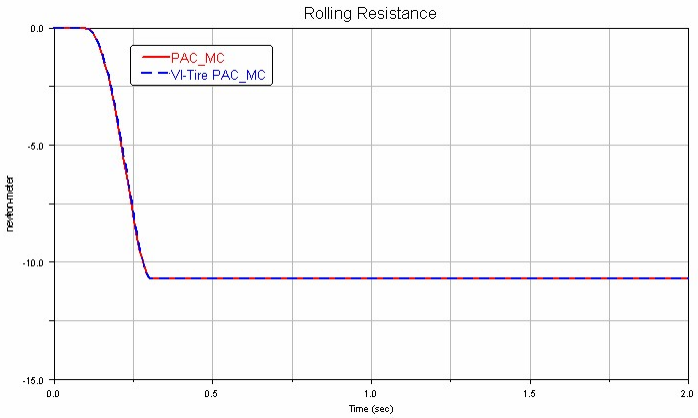
```
PROPERTY_FILE_FORMAT = 'USER'
FUNCTION_NAME = 'vitools::vi_tire'
MODEL_TYPE = 'PAC_MC'
```

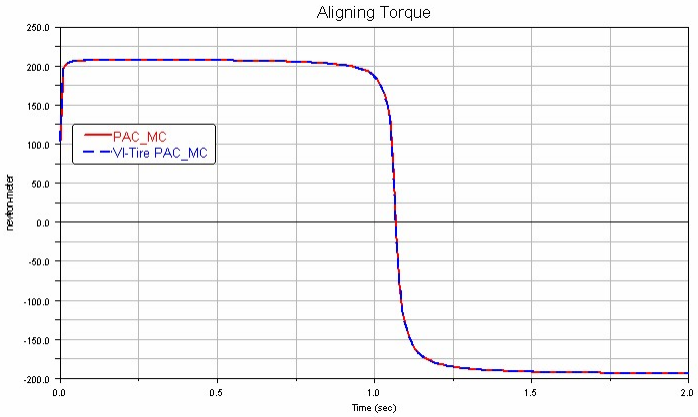
The new model has been designed to be equivalent to the previous one. The following plots shows some comparison between the 2 models:







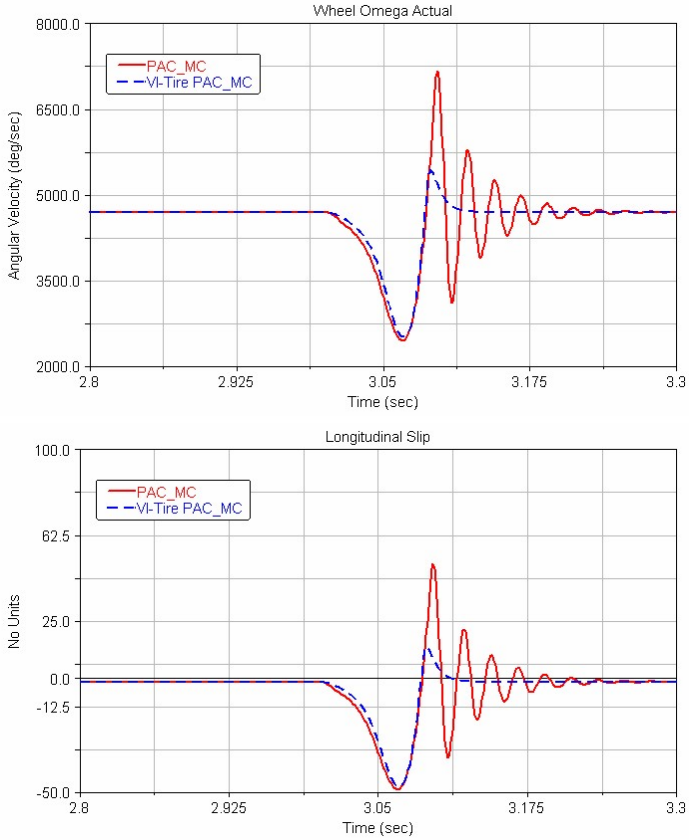




Some differences may appear at extreme inclination angles when the contact patch exceeds the limits of the supplied tire profile. When this condition occurs VI-Tire prints a warning in the ADAMS message file:

```
VI-Tire WARNING
reported in function: vi_tire
tire 2 camber angle (60.7381[deg])
exceeds profile max camber angle (60.6487[deg])
```

VI-Tire PAC_MC model includes a modified transient modeling (MODE = 14) to improve the tire response after a locking condition. The scenario is a hard braking (with wheel locking) followed by a brake release: as shown by the following plots, as soon as the brakes are released the old PAC_MC implementation responds with self exciting slip variation while the new VI-Tire PAC_MC corrects this behavior:



This improvement is switched off by default in order to preserve the compatibility with the old implementation. It can be enabled by adding the following key to the model block of the tire property file:

```
LONSLIP_MODE = 1
```

Updating to 2005r2.2

The conversion process from v2003.2 to v2005r2 is completely automatic.

Updating to 2003.2

No specific conversion is needed to migrate v2003.1 models into v2003.2

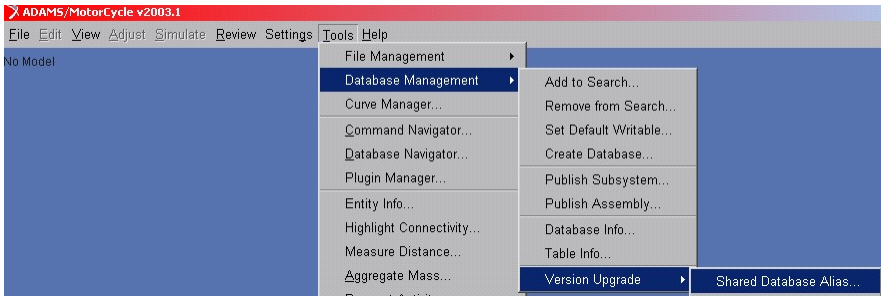
Updating to 2003.1

VI-MotorCycle v2003.1 includes an automatic procedure that will take care of updating the entire database according to the specification required by the new environment. If you need to run in v2003.1 model aligned to VI-MotorCycle version older than v12.3, please first apply the modification described in the following

paragraphs in order to get a v12.3 aligned model.

In order to run the database conversion procedure you need to declare the database to convert within a blank MotorCycle v2003.1 session. This can be done using the Add to Search command from the database management menu:

Once the database is registered, from the tools menu, select the Shared Alias Convert command:



Select the database to be converted from the list of available databases. If it doen't appear in the list, please check the previous step.

When the OK button is pressed, the database conversion will be started. It may take some time according to the number of file stored in the database.

In details the set of operation performed is the following:
1. all references to old shared databases (mcy, scooter and scooter_new) are moved to the new motorcycle_shared database
2. ARM Road data file are updated to the v2003 format (arcsub addressing based on function_name statement)
3. PAC96ADV Tire files are updated to the v2003 format (tyrsub addressing based on function_name statement)
4. all templates are converted to v2003.1 specifications and then saved in binary format

The database conversion is completed when the message "Database Conversion Completed!!" is shown.

The templates that require the biggest changes respect to the v12.3 version are the powertrain ones. The automatic procedure is able to update the most part of them, but if the structure of the template has been deeply changed respect to the shared one, the following warning may be displayed during the conversion process:

```
WARNING: the current template doesn't contain the information about the engine
         torque limitation and cannot be updated automatically.
         Please create the needed modeling components described the model updates guide
```

Manual update

The elements that should be created are:
1. a couple of state variables

2. a couple of output communicators

The variables to create should return the calculation of the torque that the engine would produce for the current rpm if the throttle is set to full demand in one case and to 0 for the second variable. The controller needs these information to compute the amount of throttle needed to follow the specified speed/acceleration profile.

In the case of the powertrain test template the 2 variables looks like:

Variable 1:

```
Object Name      :  ._powertrain_test.engine_maximum_driving_torque
Object Type      :  ADAMS_Variable
Parent Type      :  Model
Adams ID         :  0
Active           :  NO_OPINION
Initial Condition : 0.0
Function: AKISPL(MAX(0,DIF(._powertrain_test.engine_omega_xl)*9.54930),
                         MAX(0,MIN(1,1)),._powertrain_test.gss_engine_torque)*if(mode-
5:1,0,1)
```

Variable 2:

```
Object Name      :  ._powertrain_test.engine_maximum_braking_torque
Object Type      :  ADAMS_Variable
Parent Type      :  Model
Adams ID         :  0
Active           :  NO_OPINION
Initial Condition : 0.0
Function         : AKISPL(MAX(0,DIF(._powertrain_test.engine_omega_xl)*9.54930),
                   MAX(0,MIN(1,0)),._powertrain_test.gss_engine_torque)*if(mode-5:1,0,1)
```

They should match the expression used to compute the engine torque apart from reference to the throttle demand: the actual throttle demand should be replaced by the boundary throttle values.

The communicator specifications are:

Name	Class	Minor Role	Matching name
cos_engine_maximum_braking_torque	Solver_variable	inherit	engine_maximum_braking_torque
cos_engine_maximum_driving_torque	Solver_variable	inherit	engine_maximum_driving_torque

Please contact the support service if more help is needed.

Updating to 12.3

Some templates from the shared databases supplied with VI-MotorCycle 12.3 have changed to accomplish some new features introduced in the package.
The _rear_susp_std.tpl template from the mcy database includes a new output communicator for publishing the swingarm part. It is used by the new driveline model. The communicator attributes are:

Name	Class	Minor Role	Matching name
cos_swingarm	mount	inherit	swingarm

The _frame_test.tpl template from the mcy database offers a new flag (pvs_naked) for deactivating the visualization of the body shell making the template's usage more general.

The _powertrain_test.tpl template from the mcy has been enhanced to grant compatibility also with longitudinal transmission models. The orientation of the transmission output part can be controlled using a new input communicator. When the communicator is unmatched or equal to 0, the transmission output behaves as in previous version. When it is set to 1 or –1 transmission output part is rotated by 90 deg (-90deg). The specification of the new communicator are:

Name	Class	Minor Role	Matching name
cis_longitudinal_transmission	parameter_integer	inherit	longitudinal_transmission

The _driveline_w_chain_effect.tpl template has been redesigned in order to reproduce additional dynamic effects like stiffness and damping and yoke of the chain. The new model relies on separate user subroutines (id = 1284).
The pinion and sprockets part are no more connected with a coupler joint so this new model is one DOF more than the old one.
Two new parameter variables store the chain stiffness (N/m2) and damping (Ns/m2) and another one the exceeding chain length.
The interface of the template is partially changed requiring a new communicator of type mount for identifying the swing arm part. The chain_input, chain_output and total_axle_torque communicators have been removed.
A new output communicator for defining the transmission output orientation has been introduced:

Name	Class	Minor Role	Matching name
cos_longitudinal_transmission	parameter_integer	any	longitudinal_transmission

Even if the old chain model is still supported by MCY solver, it is strongly recommended to use the latest one.

The _tire_test.tpl model fixes a small bug in the sse_diff_1 parameter list. It also includes special graphics for generic tire model (different from pac96ADV).

The matching names associated to the input communicators cis_caliper_to_susp and cis_rear_caliper_to_susp of the template _2D_brake_system.tpl have changed as follow:

Name	Class	Minor Role	Matching name
cis_caliper_to_susp	mount	front	caliper_to_susp, caliper_to_suspension
cis_rear_caliper_to_susp	mount	rear	caliper_to_susp, caliper_to_suspension

The lateral slip compensation option has been improved and now it is recommended to let it on for all class of analysis.

Updating to 12.2

The rear suspension template from the mcy database has changed in order to support adjustment also when working in suspension assembly mode. In details the frame reference marker used for the ride height adjustment is no more retrieved from the frame model but is created in the location specified by the hps_rear_RH_frame_ref hardpoint. The now obsolete input/output communicators used for connecting suspension and frame have been deleted from their templates (cos_rear_RH_ref_point in frame_test template and cis_rear_RH_ref_point from rear_susp_std template).
A new output communicator of type 'mount' has been introduced to support the changes introduced in the driveline template. It's matching name should be DN_spr_reaction_part and it should refer to the spindle bearing part.

A similar output communicator has been created in the powertrain template. The communicator matching name should be DV_spr_reaction_part and it should publish the name of the powertrain block part.

The general forces used to introduce the chain tension effect in the driveline template have a new J floating marker that is located on the spindle bearing part and on the powertrain block part (as referenced by the new output communicator described above). The old driveline template set the J floating marker of the general forces on the ground part. This solve an equilibrium issue that affected the previous version where an external torque was wrongly applied on bike model modifying the vertical load transfer. Also the solver subroutine used for the calculation is changed. Please update your existing model to reference the updated version of the driveline template.

The brake system template (both the 3D than the 2D) includes a modification of the braking torque calculation. The previous version required very low brake pressure values (1000 MPa) because the brake torque calculation was performed including also the brake demand (100). The current version fixes this issue scaling to 1 the maximum brake demand and requiring of consequence an 100 time higher braking pressure. The new default for the max brake pressure is 1e5 MPa. Two new communicators have been added to the template, they are used to publish the maximum available braking torque. Their matching name is max_brake_torque_front and max_brake_torque_rear and their class is parameter_real.

The last model changes belong to the frame templates in which the pvs_aero_frontal_area has been renamed to pvs_frontal_area. Also a new hardpoint have been included to specify the location of the aerodynamic centre of pressure (previously it was coincident with the frame center of mass).

A new parameter (TIRE_SECTION_RADIUS) has been introduced in the VEHICLE block of the SDF file. Please use the SDF Update feature from the SDF Tools menu to update your existing files.

Updating to 12.1

Model created by v12.0 release doesn't need to be updated, even if the user should consider that some modifications have been introduced in many demo templates as summarized in the following table:

Template	Database	Changes:
Frame_test	mcy	• The aerodynamic longitudinal force is now always normal to the gravity. Previously it followed the bike pitch • The drag force is calculated using 2 different Cdrag coefficients: one is for standard driving while the other is used when braking
Powertrain_test	mcy	• A new actuator for generating torque at pinion level has been created. Previously the engine torque was introduced with the driveline general force. • Some new requests have been added • A bug in the engine omega differential equation has been fixed

driveline_w_chain_effect	mcy	• The chain tension effect has been separated from the engine torque.
Rear_susp_test	mcy	• Removed from the distribution. It has been replaced by the rear_susp_std template
Scooter_powertrain	scooter	• Added request for clutch torque
Scooter_powertrain	scooter_new	• Added request for clutch torque
Powertrain_flywheel	scooter_new	• Added request for clutch torque

When a model references both the powertrain_test than the driveline_w_chain_effect templates from the mcy database of v12.1, no special changes should be introduced.
Assembling old powertrain templates with the v12.1 solver will generate models without power source, so it is recommended to modify the existing assemblies in order to reference the last version of the powertrain template.

Opening a v12.0 assembly in the v12.1 release will produce the following warnings about non existing parameters:

```
WARNING: ------------------------------------------------
WARNING: Parameter D_L was not found in template __MCY_RIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter initial_engine_rpm was not found in template _MCY_RIDER_TESTRIG
```

The user should disregard these messages.
The new v12.1 longitudinal controller requires a set of parameters that are stored in the assembly file. When a v12.0 assembly is loaded into the 12.1 interface, these parameters assume the default values. When the assembly is saved it will be updated to store the current controller settings (Refer to the Adjust Controller Parameters section in the Running Analyses guide for additional details on the several parameters)

Updating to 12.0

Models built with v11.1 release could be used on v12.1 version with very simple changes as templates are updated automatically.

When a v11.1 assembly is loaded into the v12.1 GUI, the following warnings about non assigned communicator are issued:

```
Assigning communicators...
WARNING: The following input communicators were not assigned during assembly:
     testrig.cis_engine_spline
     testrig.cis_driveline_ratio
     testrig.cis_engine_I_P_ratio
     testrig.cis_transmission_input_omega
```

All the missing communicators are not required to run the model, so the user could disregard these messages.

The v12.0 controller needs only 1 setup parameter (distance preview time) so all the specification of the parameters required in v11.1 are ignored and the following warnings are showed:

```
WARNING: ------------------------------------------------
WARNING: Parameter alfa_cntr was not found in template __MCY_RIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter delta_cntr was not found in template __MCY_RIDER_TESTRIG
```

```
WARNING: ------------------------------------------------
WARNING: Parameter ygd was not found in template __MCY_RIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter ygp was not found in template __MCY_RIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter dist_cntr_active was not found in template __MCY_RIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter roll_preview_time was not found in template __MCY_RIDER_TESTRIG
WARNING: ------------------------------------------------
WARNING: Parameter speed_preview_time was not found in template __MCY_RIDER_TESTRIG
```

The user could disregard also all these warnings or could create a new assembly file referring to the old subsystem in order to prevent the visualization of warnings.

The distance preview time parameter still exists for the v12.1 controller but it should be set to a value from 0.8s to 1.2 s. Refer to the Running Analyses guide for more information about the preview time parameter.

1.6 Known Issues

The following limitations have been identified at the release time:

- VI-Rider controller — The computation of end or abort condition is performed at discrete time steps. The consequence is that 1 extra step may be written to the output file
- VI-BikeRealTime — The VI-MotorCycle to VI-BikeRealTime model export module supports only two wheeled vehicles
- VI-MotorCycle — The following warning is raised when opening an asy file which has the SOLVER_SETTINGS block defined: *"WARNING: The object . ASSEMBLY.analysis_flags will lose parametric information due to this modification"*. It happens because TLIMIT parameter is parametrized to be unit dependent and loading the assembly is session breaks such dependency. If the user changes the units in the session with the assembly file opened, the TLIMIT parameter won't reflect the units modification.
- VI-MotorCycle — Opening *Adjust -> Hardpoint -> Table* or *Adjust -> Parameter Variable -> Table* results in command language errors when there is a MODEL in the session which is not a conventional VI-MotorCycle model (model which doesn't define *model_class* variable)..
- VI-Road — When simulating with MF-Tyre/MF-Swift tire model from TNO, user roads (METHOD = 'USER' in RDF file) are not supported. Refer to TNO documentation for all the details regarding tire-road interface.

1.7 Revision History

1.7.1 Release 2018.19.0

Added Capabilities:

Change ID	Description
4554	Add environment variable to set solver (f77 or c++) for weave&wobble analysis
4035	Add pvs to control interpolation mode in 6 poster testrig

3978	Enhance adjustable force ude with a request and expose the hidden 'adjustment_length' parameter to the user
2847	Introduce drop testrig loadcase files
2714	Enable vdf_template input in path compensation event
2710	Extract progressive_to_swing rear suspensions
2709	Integrate adams/explore in vi-motorcycle
1617	Missing link graphic in six poster testrig rigid wheel part
1486	Steering joint ude acting on 2 bodies

Bugs Corrected:

Change ID	Description
4817	Tire belt mass initial speed is not initialized
4807	Vidriver refuses to initialize with 1 single line in gear table
4110	6poster error when simulating with frame input displacement/rotation
4003	Wrong gyro position when deactivating rear wheel subsystem
3980	Tire belt mass initial speed is not initialized
3976	Wrong overturning moment sign in suspension testrig gforce
3975	Virider_path_compensation distance request is always 0 in path compensation event

1.7.2 Release 2017.18.0

Version	Change ID	Change
2017.18.0	FDB-5607	add tirelimits solver routine documentation
	FDB-5506	asy header comments are not read in VI-MotorCycle
	FDB-5425	add output step parameter in stability analyses
	FDB-5418	integrate testrig management features in VI-MotorCycle
	FDB-5290	VI-Bike export: manage different bump/rebound travel for front and rear suspension
	FDB-5287	parametric rider template custom gui has hard-coded reference to ges_rider
	FDB-5196	implement a drop testrig
	FDB-5195	implement a six poster testrig
	FDB-5172	VI-Bike export: empty progression curves when exporting a model with 0 rebound limit
	FDB-5094	VI-Bike export: wrong xgr with multiple parts rider subsystem
	FDB-3757	VI-Bike export: implement automatic model validation

1.7.3 Release 2015.17.0

Version	Change ID	Change
2015.17.0	FDB-4952	Implement luggage model
	FDB-4907	VI-Bike export doesn't consider adjustment_active flag
	FDB-4883	Error using "edit vdf" button with multiple vdf files
	FDB-4878	VI-Bike export: manage luggage parts
	FDB-4870	VI-Bike export: progression curves are empty if an analysis fails
	FDB-4783	Adding camber contribute in Tire Testrig motion for slip computation

	FDB-4780	VI-Bike export: manage ac_linear_damper
	FDB-4595	Engine rpm not initialized with scooter without flywheel part
	FDB-4403	Tire force graphics active generates a corrupted adm
	FDB-4233	2 Poster Create RDF Tool is not compatible with res file
	FDB-4152	VI-Bike export: manage asymmetric suspension components
	FDB-4047	Suspension surface response simulation is not compatible with res file
	FDB-3976	VI-Bike export: error with multiple components with same symmetry
	FDB-3865	Adj_diff ude parameters not saved in subsystem file
	FDB-3688	Implement press maneuvers event for VI-Motorcycle models
	FDB-3431	Implement CVT powertrain model

1.7.4 Release 2013r2.16.0

Version	Change ID	Change
2013r2.16.0	FDB-3801	Application crash modifying the cos_engine_mount communicator in the frame_test template
	FDB-3786	Support frame and powertrain templates in suspension assemblies
	FDB-3780	Noisy steering torque produced with the figure 8 event
	FDB-3754	Two poster road reconstruction example file is broken
	FDB-3122	Force graphics visualization is wrong for two poster simulation
	FDB-3094	User defined content for result files is neglected
	FDB-2993	Support for Adams 2013.2
	FDB-2988	Request/Nam file are not created with the model contains a flexible body
	FDB-2903	Potential solver crash on analysis termination when no vi-grade license is found
	FDB-2896	Export to BikeRealTime failure using result files instead of request
	FDB-2829	Tire force graphics does not work when result file is loaded from ppt
	FDB-2636	Tire force graphics visualization is wrong for 3d road
	FDB-2596	Static load for suspension analysis
	FDB-2342	Single wheel travel mode for 2 poster analysis
	FDB-2027	Log file for 2poster simulation reports incorrect velocity units
	FDB-1697	VI-Rider connecting contour visualization
	FDB-1695	VI-Rider path compensation procedure implementation

1.7.5 Release 2013.15.0

Version	Change ID	Change
2013.15.0	FDB-2275	Left/Right PSD values may be assigned to wrong tire ID
	FDB-2732	Adopt CXX as default solver, adopt RES as default output file
	FDB-2690	Could not create road geometry for OpenCRG roads
	FDB-2639	New Figure 8 Event
	FDB-2614	Angular velocity of wheel template unbalanced mass may not be initialized properly
	FDB-2468	Too strong reaction from longitudinal controller to pitch movements
	FDB-2447	Gear shifting parameters defined as function of path_s

	FDB-2366	Problems matching the VIRIDER testrig gyro communicator from an input commutator with minor role inherit
	FDB-2261	New rider template with parametric body posture
	FDB-2260	Failure running VI-BikeRealTime export 2 times consecutively
	FDB-2828	Support non VI-Tire PAC-MC implementation
	FDB-2021	Two poster simulation supports only locked wheels mode
	FDB-1999	New cosimulation tutorial
	FDB-1960	Replace subsystem process fails after first simulation submit
	FDB-1901	Stability simulation paramters are lost switching to SLO mode
	FDB-1889	Velocity end condition may trigger incorrectly at time=0.0
	FDB-1743	LMUX scaling factor for VI-Tire PAC-MC does not affect simulation results
	FDB-1601	Store sensors trigger value in assembly file
	FDB-1594	Suspension analsys fails when rebound travel is smaller than output step
	FDB-1540	Discontinue SDF based analysis
	FDB-1496	Export bike geometry to VI-BikeRealTime
	FDB-1486	New VI-SpeedGenMoto event for predicting speed profiles
	FDB-1484	support for Adams 2013
	FDB-1451	Front brake pressure request in 2d brake system template is wrong
	FDB-1443	Tire transient is neglected during linearization
	FDB-1404	Brake template geometry is no scaled properly changing units
	FDB-1197	Moveable rider model driven by VI-Rider controller
	FDB-1044	Brake demand increases when a downshift occurs
	FDB-948	Static analysis failure with ARC904 road model
	FDB-156	Support for 2 chain elements in one assembly

1.7.6 Release 2010.13.0

Version	Change ID	Change
2010.13.0 2008.13.0	FDB-1278	Emdedding Visual C++ redistributable in main installer
	FDB-1248	Support VI-TireLimits
	FDB-1204	Support cubic interpolation for longitudinal maps
	FDB-1203	VI-Rider support for map scaling factor
	FDB-1172	Support C++ solver
	FDB-1145	Powertrain idle control does not work when clutch is closed
	FDB-1144	EDS module generates multiple clutch actions when min gear is greater than 1
	FDB-1047	Chain model documentation reports wrong formula for sprocket equivalent radius
	FDB-992	Support transimission efficiency in shared templates
	FDB-977	Perform batch test after installation to avoid permission issues accessing shared files
	FDB-916	Canned events wrongly hardcode output step to 100hz
	FDB-906	Support export to VI-BikeRealTime of models without chain
	FDB-904	Fixed VI-BikeRealTime CG height export

1.7.7 Release 2008r1.12.0

Version	Change ID	Change
2008r1.12.0	FDB-868	Update existing RDF files to the VI-Road format (deprecate ARM road solver)
	FDB-623	Document testrig parameters
	FDB-562	Support correct testrig output names for result file
	FDB-559	Add a saturation threshold for the driveline back torque
	FDB-536	Reivewed powertrain data for the shared assemblies
	FDB-511	Report files longitudinal center of gravity info may be wrong in setup condition
	FDB-479	Added straight line acceleration maneuver
	FDB-437	Added new rear suspension shared template with a cleaner structure
	FDB-422	Added new front suspension shared template with a cleaner structure
	FDB-421	split body geometry from main chassis template
	FDB-402	Add FAQ section to online documentation
	FDB-383	Create a cosimulation tutorial
	FDB-337	acf file for cosimulation is incomplete
	FDB-334	Support DCD function of s coord
	FDB-322	Fixed units support for solver subroutines vdv_outvar and vdv_oureq
	FDB-384	Solver Variable holding aero drag force use frame reference instead of gyro one
	FDB-372	Created template documentation
	FDB-336	Roll and pitch sensors may no stop analysis properly
	FDB-345	Instant braking analysis fully event file based
	FDB-332	Support brake rear demand (brake2) in DCD file
	FDB-324	Enhanced chain model formulation for symmetric tension and stiffness/damping definition
	FDB-209	Fixed chain request naming for result file
	FDB-148	Defined default end condition set for __MCY_VIRIDER_TESTRIG

1.7.8 Release 2005r2.11.0

Version	Change ID	Change
2005r2.11.0	-	Included automatic routines for run time initialization of engine omega
	-	Included automatic routines for run time initialization of generic parts omega
	-	included new VI-Rider model with EDS logic
	-	New html/pdf documentation
	-	Removed _scooter_powertrain template from shared database
	FDB-75	Preserve res file creation setting when no flex body are defined for suspension analysis
	FDB-92	Fixed rider template orientation parameterization for central torso part
	FDB-129	Fixed frequency request for 2 poster analysis
	FDB-163	Fixed exportation of rdf file from 2 poster analysis
	FDB-209	Fixed chain tension request data for result file output
	FDB-211	Weave & Wobble initial linearization is now performed before applying initial speed

1.7.9 Release 2005r2.10.0

Version	Change ID	Change
2005r2.10.0		MMKS as default unit system Enhanced two poster testrig Switched to VI-Tire model (available enhanced transient model) Added VI-Road support Added vehicle setup report computation Removed requirement of gyro information from the suspension templates Generate batch file for non interactive analyses (full vehicle + suspension) Fixed bug in longitudinal controller PID gains retrieving from SDF Fixed psd road profile discontinuity issue Support for non mks units (required updates in powertrain and body templates) Added smoothing on drag/drag brake torque Analyses update SDF option assign to SDF the analysis name

1.7.10 Release 2005r2.1

Version	Change ID	Change
2005r2.1		Fixed support for open loop gear demand based on dcd file Supports for both GSE and DIFF based tires Fixed bug calling linear during weave and wobble analysis Added open loop function support for steering torque analysis

1.7.11 Release 2003.2

Version	Change ID	Change
2003.2		Added new requests to suspension templates for upright acceleration Fixed assembly initialization when new assembly is created Added rider major role Support for non standard names in brake model Improved path builder/road builder integration Assigned null mass and inertia to testrig gyro part

1.7.12 Release 2003.1

Version	Change ID	Change
2003.1		Plugin Architecture improves integration with other ADAMS modules New longitudinal controller based on Feed Forward technology Support for longitudinal acceleration maps New motorcycle tire model (PAC-MC) New Constant Radius Cornering analysis New Stability Procedure simulation New Scooter Model New Road Builder plugin including the path builder utility Improved capability of running multi maneuver analyses Improved lateral controller New scooter front suspension template

		New scooter body template Replaced the Road_output requests with SmartRider_Monitor ones Fixed minor role of front_brake_demand communicator is __2D_brake_system template Added orientation variable to rider template Added SDF files for a full lap on MSC Track path for both the demo assemblies Scooter_powertrain template in scooter database renamed to scooter_powertrain_float Scooter_rear_susp template in scooter database renamed to scooter_rear_susp_float

1.7.13 Release 12.3

Version	Change ID	Change
12.3		New chain model Two poster testrig model Revised scaling factor for standard .tir files Improved controller behavior for high lateral slip analysis Added caster measure to suspension testrig Support for longitudinal driveline in suspension testrig Added sinusoidal signal to torque analysis New tire and rim graphics for pac96adv model Generic tire graphic for other tire models Resolved solver crash when static equilibrium fails with adjustments Default marker for aggregate mass is gyro cm Weave and wobble analysis performed with and without damping Minor changes to shared templates (see model conversion for details) Improved test suite structure

1.7.14 Release 12.2

Version	Change ID	Change
12.2		DRD path file support Dynamic suspension surface response analysis SDF Driven analysis SDF update feature Tire overturning moment compensation Road Irregularities (PSD) – new test file for 3D road with PSD Adjustment supported in suspension analysis Road Builder RDF Convert Tool Fixed driveline model

1.7.15 Release 12.1

Version	Change ID	Change
12.1		Improved controller stability Higher controller precision New longitudinal controller module Smart Driver File support New interface for creating road shell graphics Implemented sensors for stopping analyses

		Enhanced road builder interface Fixed bug in powertrain and driveline templates New rear suspension template Revised aeroforce model Revised bike body requests Fixed reload analysis feature Added clutch torque request to all the powertrain templates Self Installing executable

1.7.16 Release 12.0

Version	Change ID	Change
12.0		New controller : - able to drive at low speed - smoother response - reduced calculation time 3D Road support Automatic detection of initial speed from rdf file Improved Road Builder toolkit New road corner cutting algorithm New combined slip tire property files New scooter model Package test files included

1.7.17 Release 11.1 sp2

Version	Change ID	Change
11.1 sp2		Tire builder implementation (tire shell graphics) Road builder GUI Automatic mass adjustment with/out rider New Steering joint UDE Improved Instant braking analysis (brake torque assigned directly from user) New GUI for weave and wobble analysis Log analysis feature implemented Background mode for analyses Fixed private database declaration Tire Gforces ID now always set to 1 and 2 (required for 3D Road) Driver road distance measured in road plane All Road output request now are measured in the gyro position New icon for road edit button New adjustment forces tutorial Enhanced documentation contents and layout

1.7.18 Release 11.1 sp1

Version	Change ID	Change
11.1 sp1		Instant braking analysis Impulse steering torque Fixed Graphic Road Step Size lower limit

1.7.19 Release 11.1

Version	Change ID	Change
11.1		Automatic Shifting Feature Graphic Road Step Size Updated Menu Layout

1.7.20 Release 11.0

Version	Change ID	Change
11.0		Base Package

www.vi-grade.com
email: info@vi-grade.com