



Morse Systems Engineering  
and Auros  
2018 Knowledge Aware Conference

Andrea Amatori  
BorgWarner Morse Systems  
Senior Staff Engineer  
September 25, 2018



# Content

- BorgWarner and Morse Systems
- Where we had left it off 2 years ago
- What we have done in these 2 years
- Auros set up for Morse Engineering
- Early successes
- Moving forward

# Content

- BorgWarner and Morse Systems
- Where we had left it off 2 years ago
- What we have done in these 2 years
- Auros set up for Morse Engineering
- Early successes
- Moving forward

Our Mission:  
Propulsion System Leader for  
Combustion, Hybrid and Electric Vehicles



Combustion



Hybrid



Electric

# BorgWarner at a glance

29,000  
employees

66 17  
Locations Countries

2017 Sales  
\$9.8 Billion  
consolidated

Financial and Employee information as of February 8, 2018  
Location information as of January 1, 2018

# Strategic Global Operations

**23**

locations  
in the  
Americas

**19**

locations  
in Europe

**24**

locations  
in Asia

BorgWarner partners with customers around the world to bring the right technology to market at the right value.

Locations as of January 1, 2018

# Morse Systems at a glance

Engine Timing  
Systems

Solenoids and  
Actuators

HY-VO®  
Drivetrain Chain

Chargers &  
Batteries

18 Locations  
10 Countries

Performance

Efficiency

Customer  
Value

# Morse Systems Key Product Areas

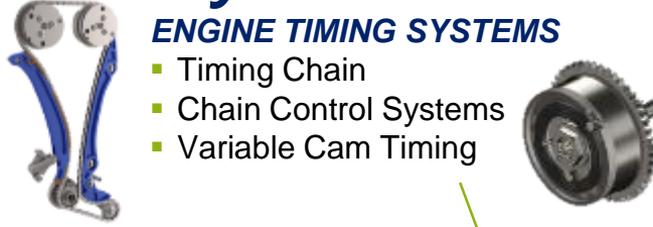
## DRIVETRAIN CHAINS

- Transfer Case Drives
- Transmission Final Drive
- Off-Axis Hybrids
- Conventional and CVT



## ENGINE TIMING SYSTEMS

- Timing Chain
- Chain Control Systems
- Variable Cam Timing



## SOLENOIDS AND ACTUATORS

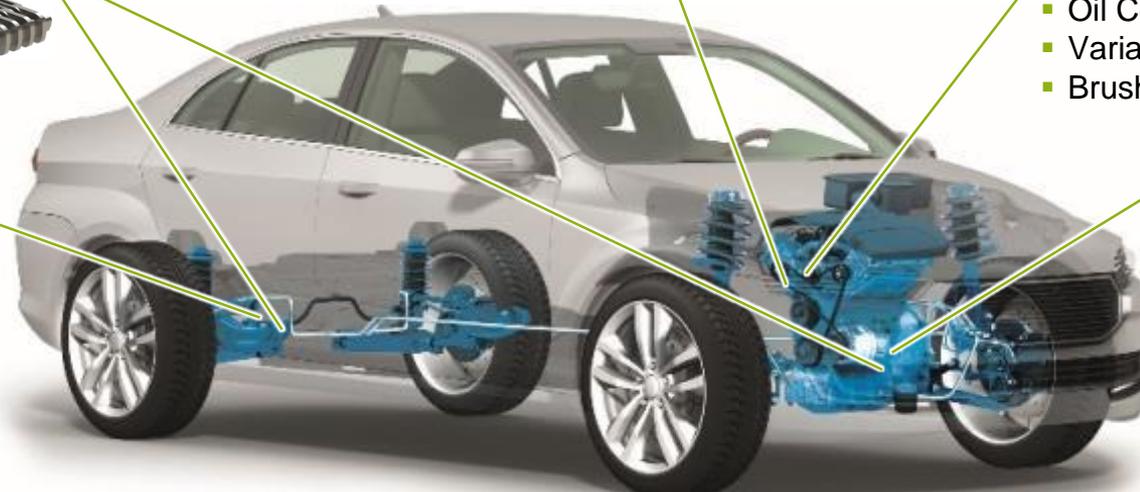
- Oil Control Valves
- Variable Force Solenoids
- Brushless Motors



## BATTERY CHARGING



## P0 Tensioner



# Engineering Centers

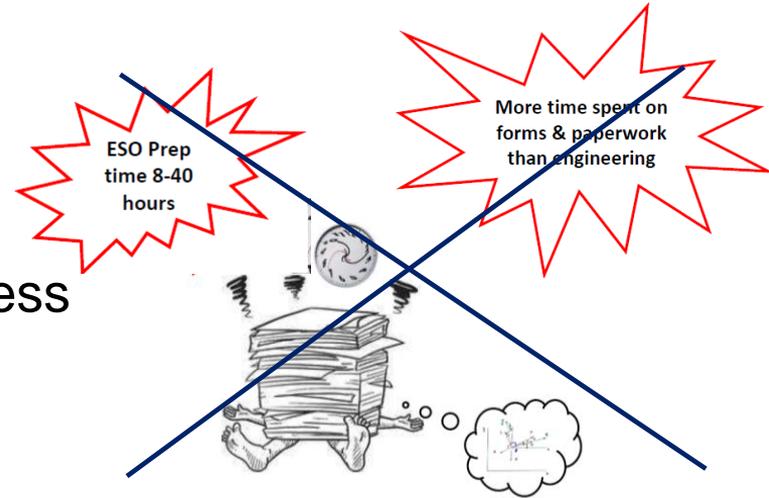


# Content

- BorgWarner and Morse
- Where we had left it off 2 years ago
- What we have done in these 2 years
- Auros set up for Morse Engineering
- Early successes
- Moving forward

# Objectives of Auros Implementation

- More efficient Product Development Process
- Foster Knowledge sharing and growth



# Population of software considered



# Initial Review of Tools & Solutions

		Current MIX	Goldfire	Auros	Jira	Confluence	Google Drive	Tibbr	Office 365		
									Yammer	SharePoint	OneDrive
Accessibility	Community	Email	No	X	X	X	X	X	X	X	X
	Web-Based	ICE	X	X	X	X	X	X	X	X	X
	Languages	Various	X	X	X	X	X	X	X	X	X
Searchability	Internal	Network	X	X	X	X	No	No	No	No	No
	Proximity	No	X	X	No	No	No	No	No	No	No
	External	Google	X	No	No	No	No	No	No	No	No
Assessments	Knowledge	?	No	X	No	No	No	No	No	No	No
	Project	ESO-ICE	No	X	No	No	No	No	No	No	No
Knowledge Use/Sharing	In Workflow	No	No	X	No	No	No	No	No	No	No
	Authoring	LL-Approval-DG-Approval-Post	No	X	No	X	No	No	No	X	No
	Reviewing	ICE	No	X	No	X	No	No	No	X	No
<b>Primary Use</b>			R&D	<b>PDP &amp; KM</b>	Software Development	Store, Share, Organize	Doc Store, Sync, Share	Social Networking	Social Networking	Doc Store, Organize, Share	Doc Store, Sync, Share

# Auros Pilot Scope Map

KEY	Fully Functional	Place Holder	Out of Scope
-----	------------------	--------------	--------------

Functional Groups	Product Development	Prototype	Manufacturing	Quality	Testing	Analysis	Purchasing
Product Groups	Applications	Components	Group 2	Group 3	Group 4	Advanced	
Function	SOR	Program Assumptions	Design Knowledge		Design Validation		ESO
Method	Project information	Assumptions Form	DKP Checklist		DVP Checklist		ESO Checklist
Content		Program Information	Guide file Drawings	Design Procedures	Component DVP	NUD DVP	ESOK   ESO1
		Product Assumption	Catalogs	Lessons Learned	System DVP	Customer DVP	ESO2   ESO3
		NUD Identification	PLM Integration	CAD Integration	Test Requests	Analysis Requests	Open Issues
Report	Requirements Management (PROI)		DKPR		DVPR		ESO

Requirements → Design → Validation → Approval



CONFIDENTIAL INFORMATION



# Content

- BorgWarner and Morse
- Where we had left it off 2 years ago
- **What we have done in these 2 years**
- Auros set up for Morse Engineering
- Early successes
- Moving forward

# Auros In Morse



220 Product  
Engineers and  
Designers  
7 Product Lines  
10 global locations

GO LIVE TS USA/EU  
MAY 2018

GO LIVE TS Asia and  
Solenoids Globally  
August 2018

GO LIVE VCT Globally  
mid September 2018

Knowledge from Design Guide  
Product Development Process  
Lessons Learned

Customer Programs  
Development Programs

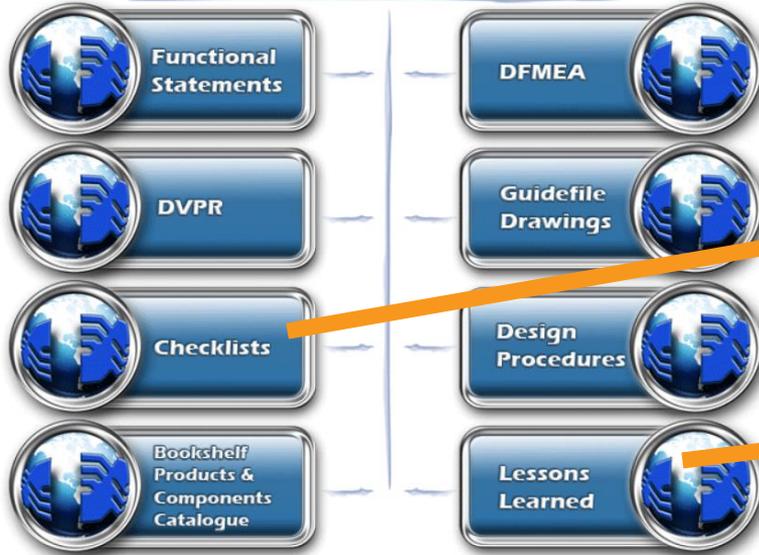
# Development Approach

- Core Team of experienced senior Engineers, owners of the Design Guide content, meets more than once a week through Skype
- Face to face workshops
- Group of Key Users, one for each product line and location
- Product group teams
- Steering Committee reviews

# Creating K-PACs from the Design Guide

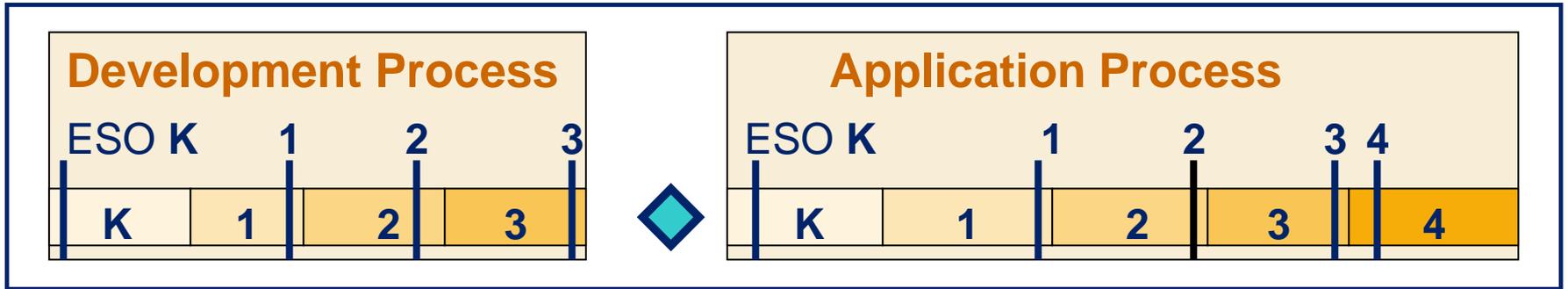


## Engine Applications Design Guide



ID	Category	Item Name	Date	Description	Additional Information	Image/Thumbnail
APR-01	V3	Transition Air Pre Heated	22-Nov-2017	If of free strand pitches at the entrance and exit of a transition pipe.	As the chain wraps or grapples, the Transition will rotate at the exit of the pipe. To ensure the chain does not become entangled, the Transition must be designed to allow for free rotation. The Transition must be designed to allow for free rotation. The Transition must be designed to allow for free rotation.	
APR-02	V3	Clearance from to Sprinkler Test Tip	22-Nov-2017	Radial offset from sprinker test tip to nearest point of contact with sprinker arm ends (for assembly purposes to prevent pinching).		
APR-04	V5	Guide Run-In	26-Jun-2018	Chain guide offset into chain path from free target to sprinker.	Building the guide into the chain path will provide better alignment and reduce the risk of chain damage. The guide should be designed to allow for free rotation. The guide should be designed to allow for free rotation.	
APR-02	V6	Chain Guide Entrance and Exit Radii	26-Jun-2018	Chain guide entrance and exit radii (ensure larger radii guide first radius).	Entry and exit radii are required to ensure chain alignment. The radii should be designed to allow for free rotation. The radii should be designed to allow for free rotation.	
APR-04	V5	Guide Free Strand	22-Nov-2017	If of unattached free strand chain pitches from guide contact at both ends.	Insufficient free strand length may result in WHM and chain damage. The free strand length should be designed to allow for free rotation. The free strand length should be designed to allow for free rotation.	

# Morse Product Development Process



# Engineering Sign Off in Auros

Item #	Requirement	Document	Evidence/Output	Required - ESO Gate	Reviewed (G/R) (NA)
1A	Requirements Management	Program Assumptions	Product Documented		
1B		MF-E-GEN-010	Hydraulic		
1C		MF-E-GEN-010	Application/definition compliance (PROC)		
2B	Design Review	MF-E-GEN-010	Engine		
4A		DG-APP-CL-001	Chain Drive		
4B		DG-APP-CL-001	Sprocket		
4C	Design Guide Check List as applicable	DG-APP-CL-001	Chain Drive		
4D		DG-APP-CL-001	Tensioner		
4E		DG-TEN-LL-001	Hydraulic		
4F		DG-TEN-LL-001	Mechanical		
5A		DG-APP-LL	Chain Drive		
5B		DG-APP-LL	Engine		
5C	Lessons Learned as applicable	DG-APP-LL	Sprocket		
5D		DG-APP-LL	Chain Drive		
5E		DG-APP-LL	Tensioner		
5F		DG-TEN-LL	Hydraulic		
5G		DG-TEN-LL	Mechanical		
6A			Chain Drive System DFMEA		
6B			Engine Chain DFMEA		
6C			Sprocket DFMEA		
6D	DFMEA as applicable		Chain Guide DFMEA		
6E			Tensioner Arm DFMEA		
6F			Hydraulic Tensioner DFMEA		
6G			Mechanical Tensioner DFMEA		
7	Critical Parameter Management as applicable	MF-E-GEN-010	Identified Critical Parameter (Control Plan) for main component. Critical parameters for "backhaul" path require unique identification (CPs)		NA
8A			Chain Drive System DVP&R		
8B			Engine Chain DVP&R		
8C			Sprocket DVP&R		
8D	DVP&R as applicable	MF-E-GEN-010	Chain Guide DVP&R		
8E			Tensioner Arm DVP&R		
8F			Hydraulic Tensioner DVP&R		
8G			Mechanical Tensioner DVP&R		
9A			System Simulation Results (Worse case tension plot, summary chart)		
9B	Supporting Data as applicable		Engine Performance Data (Worse case tension plot, summary chart)		
9C			ETAG contract with the customer		
9D			Returned Hardware (ETAG violations, summary graphs for chain wear)		



Item #	Requirement	Document	Evidence/Output	Required - ESO Gate	Reviewed (G/R) (NA)
4A	Design Guide Check List as applicable	DG-APP-CL-001	Chain Drive		
4B		DG-APP-CL-001	Sprocket		
4C		DG-APP-CL-001	Chain Drive		
4D		DG-APP-CL-001	Tensioner		
4E		DG-TEN-LL-001	Hydraulic		
4F		DG-TEN-LL-001	Mechanical		
5A		DG-APP-LL	Chain Drive		
5B		DG-APP-LL	Engine		
5C	Lessons Learned as applicable	DG-APP-LL	Sprocket		
5D		DG-APP-LL	Chain Drive		
5E		DG-APP-LL	Tensioner		
5F		DG-TEN-LL	Hydraulic		
5G		DG-TEN-LL	Mechanical		
6A			Chain Drive System DFMEA		
6B			Engine Chain DFMEA		
6C			Sprocket DFMEA		
6D	DFMEA as applicable		Chain Guide DFMEA		
6E			Tensioner Arm DFMEA		
6F			Hydraulic Tensioner DFMEA		
6G			Mechanical Tensioner DFMEA		
7	Critical Parameter Management as applicable	MF-E-GEN-010	Identified Critical Parameter (Control Plan) for main component. Critical parameters for "backhaul" path require unique identification (CPs)		NA
8A			Chain Drive System DVP&R		
8B			Engine Chain DVP&R		
8C			Sprocket DVP&R		
8D	DVP&R as applicable	MF-E-GEN-010	Chain Guide DVP&R		
8E			Tensioner Arm DVP&R		
8F			Hydraulic Tensioner DVP&R		
8G			Mechanical Tensioner DVP&R		
9A			System Simulation Results (Worse case tension plot, summary chart)		
9B	Supporting Data as applicable		Engine Performance Data (Worse case tension plot, summary chart)		
9C			ETAG contract with the customer		
9D			Returned Hardware (ETAG violations, summary graphs for chain wear)		

# Use Statistics to now

- Number of active Users: 177
- Number of active CoPs: 8
- Number of K-PACs: 1580
- Number of Assessments: 284
- Number of Issues: 371

# Content

- BorgWarner and Morse
- Where we had left it off 2 years ago
- What we have done in these 2 years
- **Auros set up for Morse Engineering**
- Early successes
- Moving forward

# CoPs



Applications - Engine Chain Drive Systems (APP)

Arms or Guides (AGP)

Actuators (SOL)

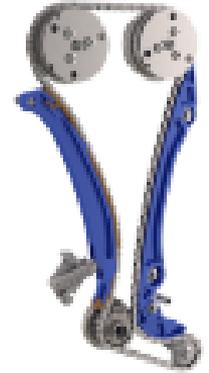
Chain Products (CHAIN)

Hydraulic Tensioners (HTEN)

Hydraulic Variable Cam Timing (HVCT)

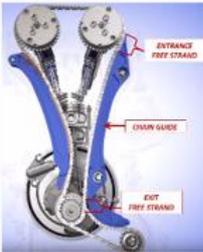
Mechanical Tensioners (MTEN)

Sprocket (SPK)



# K-PACs

**K-PAC Title** Guide Free Strand  
**Description** # of unsupported free strand chain pitches from guide contact at both ends  
**Additional Information** Insufficient free-strand length may result in NVH and chain guide face pitting. Large free-strands may allow chain strand vibration also resulting in face damage.



Description of ENTRANCE and EXIT free strand locations for a fixed chain guide.

Entrance Free Strand		Exit Free Strand	
Pitches		Pitches	
Range		Range	

**Other Info**

Notes  
 K-PAC Type Checklist  
 Criticality  
 K-PAC Status Active  
 Current Version Published Date 22-Nov-2017

Author Atzberger, Brian (batzberger)  
 Contact  
 K-PAC Core Template Basic

**Support Document**

**Filtering Elements**

ESO Gate 1, 2, 3, 4  
 Drive Type Engine  
 K-PAC USE Application, Development  
 Product Type AGP: Guide

**Attributes**

Pushed To(CoP) AGP  
 Pulled By(CoP)  
 Document DG-APP-CL-001  
 K-PAC Level Design Rule  
 K-PAC Ref  
 K-PAC Set

**K-PAC Title** Chain Drive System DVPR  
**Description** Standard DVPR for timing drive system  
**Additional Information**

**Value Table**

**Other Info**

Notes  
 K-PAC Type DVPR  
 Criticality High  
 K-PAC Status Active  
 Current Version Published Date 29-Nov-2017

Author Atzberger, Brian (batzberger)  
 Contact  
 K-PAC Core Template Basic

**Support Document**

[Timing System Application DVPR Acceptance Criteria](#) Engine Applications Guide File DVPR Acceptance Criteria  
[Timing System Application DVPR Guide File](#) DVPR Guide File

**Filtering Elements**

ESO Gate 1, 2, 3, 4  
 Drive Type Engine  
 K-PAC USE Application, Development  
 Product Type APP: System

**Attributes**

Pushed To(CoP)  
 Pulled By(CoP)  
 Document MTP-E-GEN-007- Attachment A  
 K-PAC Level Design Consideration  
 K-PAC Ref  
 K-PAC Set

**Teams**

# Value Tables

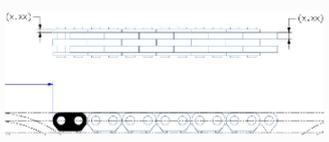
	Clearance to all engine components
Value	5
Reported	1.91
	mm
	Minimum

	Are all fasteners for BW components common size (M6, M8, etc.)?
Value	YES
Reported	YES
	unitless
	Yes/No

# Links to PLM

**CHAIN-262**

K-PAC Title **Guidefile Drawing: Silent Chain Assembly**  
 Description **Inverted Tooth Silent Chain Guidefile Drawing**  
 Additional Information See "Support Document" for Link to Teamcenter Guidefile Item drawings.



Enter Image Text Here

Value Table	
Other Info	
Notes	
K-PAC Type	Guidefile Drawing
Criticality	High
K-PAC Status	Active
Current Version Published Date	06-Nov-2017
Author	Russo
Contact	Russo
K-PAC Core Template	Basic

Support Document

Silent Chain Assy GF	Silent Chain Assy GF
----------------------	----------------------

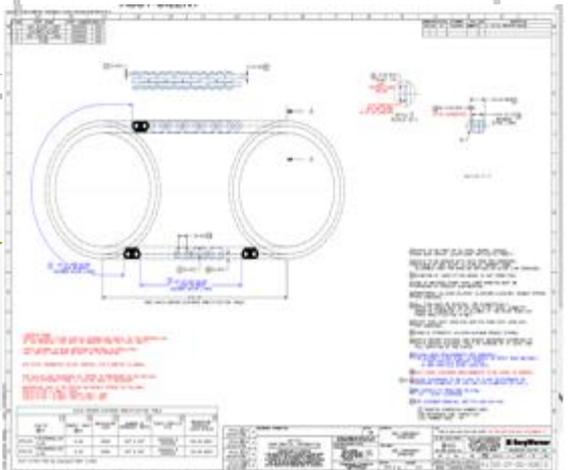
Filtering Elements

enti Azioni Guida

Elimina Proprietà Aggiungi ai preferiti

My Teamcenter

- GUIDE-0000005-CHN-ASSY-SILENT
  - GUIDE-0000005-C-CHN-ASSY-SILENT
  - GUIDE-0000005-D-CHN-ASSY-SILENT A
  - GUIDE-0000005-E-CHN-ASSY-SILENT A
    - BWMlgPartRel
    - BW\_Cust\_Dwgs
    - BW\_Customer\_Info
    - Design
    - GUIDE-0000005-E
    - GUIDE-0000005-E-CHN-ASST Visualizza T A
    - Riferimenti
    - GUIDE-0000005-E-CHN-ASST Visualizza T A
    - GUIDE-0000005-E-CHN-ASST Visualizza T A
    - GUIDE-0000005-E-CHN-ASST Visualizza T A
    - ES900062-Pin Push Out Force
    - ES900063-Chains prestress
    - QS900002-Chain Identification System
    - QS900001-Cleanliness Evaluation
    - catia\_multi\_model

# Links to Sharepoint

Export Action Proximity Search Reports Edit

**CHAIN-212**

K-PAC Title Chain Center Distance and Center Distance Tolerance  
 Description Chain Center Distance and Center Distance Tolerance  
 Additional Information

**Value Table**

**Other Info**

Notes		
K-PAC Type	Design Procedure	Au
Criticality	High	Cor
K-PAC Status	Active	K-PAC Core Temp
Current Version Published Date	06-Nov-2017	

**Support Document**

<a href="#">CD Procedure</a>	CD Procedure
<a href="#">Chain CD Calculator</a>	Chain CD Calculator

**Filtering Elements**

Drive Type	Drivetrain, Engine
K-PAC USE	Application
Product Type	CHAIN: HyVo, CHAIN: Roller/Bush, CHAIN: Silent
ESO Gate	na

Azioni sito Sfoglia Pagina Welcome Amatori, Andrea (Milan)

**BorgWarner** Chain Products Design Guide

Questo sito: Chain Pro

ICE Home Functions / Business Units Global Councils/Teams ICEWiki ICE Tools ExtraICE My Site

Tutto il contenuto del sito

Raccolte

Global Procedures

Training Material

Supporting Data of Lessons Learned

ICE > Functions / Business Units > Morse Systems > Morse Global > Product Engineering > Global Design Guide > Chain Products Design Guide

Chain Products Design Guide

Design Guide Template: MP-E-GEN-004 Attachment A Rev A

Morse Design Guide No:	DG-CP-DP- 003	<b>BorgWarner</b>
Revision:	C	Page 1 of 2
Originator:	Giuseppe Baddaria/Steve Siegert	Effective Date: July 21, 2015
<b>TITLE:</b> Chain Center Distance and Center Distance Tolerance evaluation		

## 1. PURPOSE

1.1. This design guide procedure is intended to outline the design procedure and tolerance specifications for chain Center Distance.

## 2. SCOPE

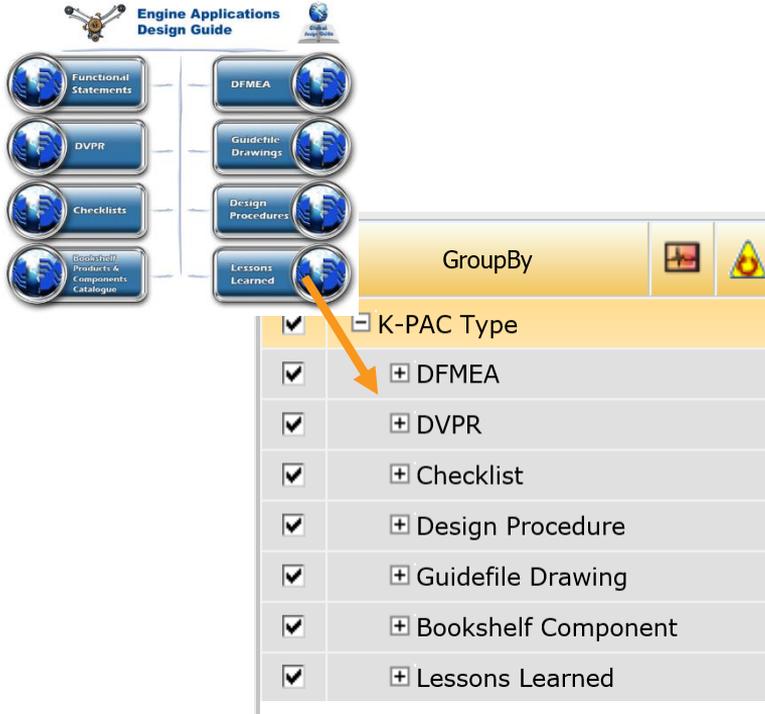
2.1. This procedure applies to all Endless Chain Assembly either Silent, Roller, Bushing or Hy-Vo.

## 3. RESPONSIBILITY

3.1. Maintenance of this document is the responsibility of Chain Product Engineering.

## 4. DEFINITION

# K-PACs EE : K-PAC Type



Item #	Requirement	Document	Evidence/Output	Required - ESD Gate	Reviewed (Lit. #) (NA)
1A	Requirements Management	Program Assumptions	Product Requirements & Assumptions Document	√	√
1B	Requirements Management	MPE-GEN03	Highlight NUD's on Program Assumptions	√	√
1C	Requirements Management	MPE-GEN08	Application/Product Requirements definition/Compliance (PRO)	√	√
2B	Design Review	MPE-GEN01	3D Models / 2D Drawings	√	√
4A	Design Review	DG-APP-CL-001	Engineering Standards	√	√
4B	Design Review	DG-SPK-CL-001	Evidence of Cross Functional Review	√	√
4C	Design Review	DG-AGP-CL-001	Chain Drive System Check List	√	√
4D	Design Review	DG-ASP-CL-002	Sprocket Check List	√	√
4E	Design Review	DG-SPK-CL-001	Chain Guide Check List	√	√
4F	Design Review	DG-ASP-CL-003	Tensioner Arm Check List	√	√
5A	Design Review	DG-TEN-CL-001	Hydraulic Tensioner Check List	√	√
5B	Design Review	DG-TEN-CL-002	Mechanical Tensioner Check List	√	√
5C	Design Review	DG-APP-LL	Chain Drive System Lessons Learned	√	√
5D	Design Review	DG-CP-LL	Engine Chain Lessons Learned	√	√
5E	Design Review	DG-SPK-LL	Sprocket Lessons Learned	√	√
5F	Design Review	DG-ASP-LL	Chain Guide Lessons Learned	√	√
5G	Design Review	DG-AGP-LL	Tensioner Arm Lessons Learned	√	√
5G	Design Review	DG-TEN-LL	Hydraulic Tensioner Lessons Learned	√	√
5G	Design Review	DG-TEN-LL	Mechanical Tensioner Lessons Learned	√	√

# K-PACs Extended Elements

Product Type	Drive Type	ESO Gate	K-PAC Level	K-PAC USE	K-PAC Type
AGP: Arm	Drivetrain	1	Design Consideration	Application	Requirements Management
AGP: CVT Guide	Engine	2	Design Rule	Benchmarking	DFMEA
AGP: Face		3		Development	DVPR
AGP: Guide		4		Localization	Checklist
CHAIN: CVT		K		Reference	Design Procedure
CHAIN: HyVo		na			Bookshelf Component
CHAIN: Roller/Bush					Functional Statement
CHAIN: Silent					Tensioner Application
HTEN: Cartridge					Chain Application
HTEN: Compact (CHT)					Sprocket Application
HTEN: Modular (MHT)					Arm and Guide Application
HTEN: No Ratchet					Design Reviews
HTEN: Rack and Washer					Critical Parameter Management
HTEN: Variable Force (VFT)					NUD Management
SPK: Counterbore Fit - Bolt on					Design Guide Update
SPK: Interference Fit					Lessons Learned
SPK: Slip Fit - Bolt on					
SPK: Slip Fit - Captured Bearing					
SPK: Slip Fit - Captured Bushing					
SPK: Tapered Bore Fit - Bolt on					
MTEN: Blade					
MTEN: Torsion Spring					

# Projects

### Modify Project Page

#### Modify Project

**Project Auros System Software** **Project ID - 444**

Project Basic Elements

<b>Project Name</b>	Auros System Software	<b>Creator</b>	Goodsell, Joe(jgoodsell)
<b>Date Created</b>	30-Apr-2018	<b>Last Update</b>	30-Apr-2018
<b>Project Description</b>	Implementation of the Auros System		

Project Extended Elements

<b>Build Level</b>	
<b>Customer</b>	
<b>Lead Engineering Location</b>	
<b>Project Owners</b>	Amatori, Andrea(aamatori);McEville, Sean(smceville)

Project Attachments

Upload Attachment | Upload Link | Screen Capture | Filter | Attachments :0

Save Project Details | Cancel

# Assessments

Tree Path: Cam Drive System.PP.ESO4.Yellow

Manage Filter Combo Filter Clear Sorting Views Advanced View Options Issues Reports

APP CK-470

Line Items Sheet  
Header

AC Content Update Available!

Group By  
K-PAC Type

Layout  
 Assessment(Grid) Layout  
 Parameter Layout

Conformance State Filter

<input checked="" type="checkbox"/> NE	<input checked="" type="checkbox"/> Green
<input checked="" type="checkbox"/> Yellow	<input checked="" type="checkbox"/> Orange
<input checked="" type="checkbox"/> Red	<input checked="" type="checkbox"/> NA

Descriptor: .

Group By	Conformance State	Status Icons	Occu

K-PAC Type

- Arm and Guide Application
- Chain Application
- Checklist
- Critical Parameter Management
- DFMEA
- DVPR
- Design Guide Update
- Lessons Learned
- Requirements Management
- Sprocket Application
- Tensioner Application

# Assessment Header

<b>Project Code</b> 	<input type="text" value="R000791_Ford"/>	<b>Status</b>	Assessment Complete
---	---	---------------	---------------------

<b>ESO Level</b> 	<input type="text" value="ESO4"/>	<b>Product Group</b> 	<input type="text" value="Applications"/>
<b>Current Evaluator</b>	Amatori, Andrea (aamatori)	<b>Creator</b>	Atzberger, Brian(batzberger)
<b>Last Update By</b>	Atzberger, Brian (batzberger)	<b>Last Update</b>	18-Jul-2018

<b>Evaluators</b>		 Atzberger, Brian(batzberger)
		 Freemantle, Paul(pfremantle)
		 Hunt, Adam(ahunt)
		 Love, Rich(rlove)
		 Manley, Joseph(jmanley)
		 Simmons, Sean(ssimmons)

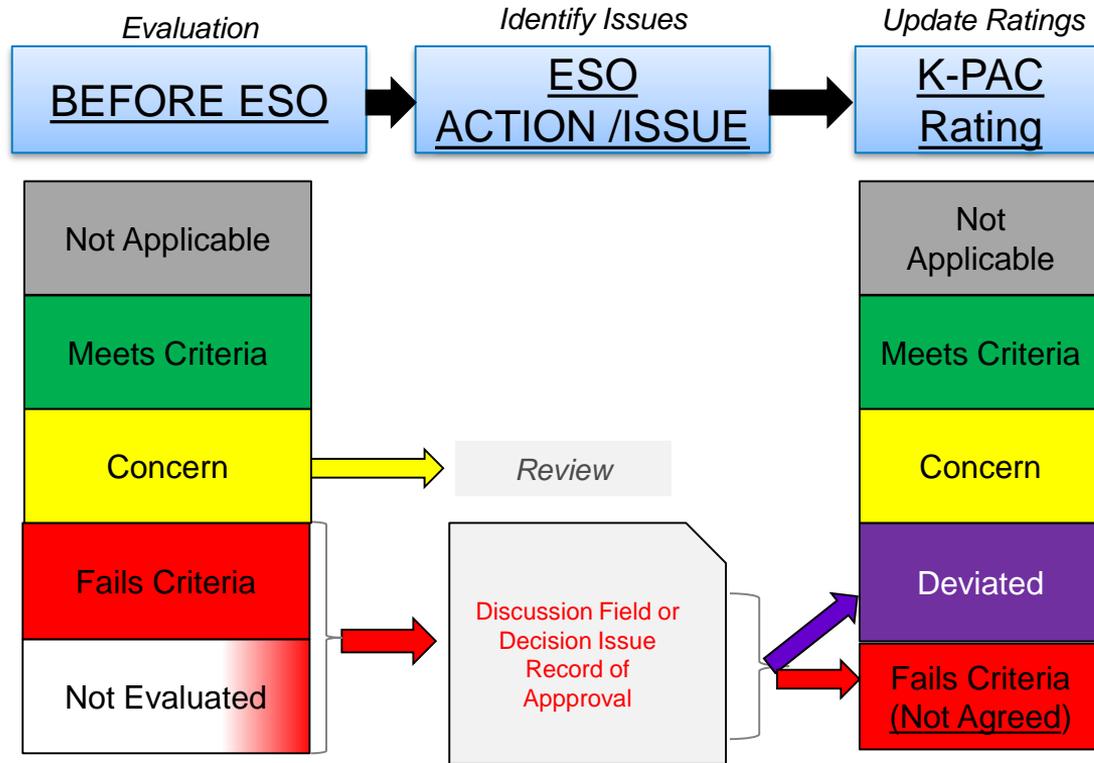
<b>AC Co-Creators</b> 
---

<b>AC Approvers</b>		
<b>Chain Products</b> 		Mattachini, Andrea(amattachini)
<b>Chain Products 1</b> 		
<b>Chain Products 2</b> 		
<b>TSC</b> 		Baddaria, Giuseppe(gbaddaria)
<b>TSC 1</b> 		
<b>TSC 2</b> 		
<b>Timing Eng Systems</b> 		Junker, Matt(mjunker)
<b>Timing Eng Systems 1</b> 		
<b>Timing Eng Systems 2</b> 		

# Assessment Header

Reported Value Source Assessments			
Assessment ID	Descriptor	Dot Path	
<b>Attendees</b>	Mattachini, Andrea(amattachini), Atzberger, Brian(batzberger), Baddaria, Giuseppe (gbaddaria), Junker, Matt(mjunker)		
<b>Build Level</b>	PP		
<b>Directional Decisions</b>	ESO Rating changed to Yellow based on nominal test results. Testing will be tracked in project open issues.		
<b>Lead Engineering Location</b>	ETC		
<b>Name</b>	Cam Drive System		
<b>Part Number</b>	5052998		
<b>Risk Rating</b>	Yellow		
<b>Risk Rating Comments</b>	ESO conducted 3/14/2018 with G. Baddaria, M. Junker, A. Mattachini. Orange rating due to rack impact test results. Refined limit testing required.		
<b>ESO Meeting Date</b>			

# KPAC Evaluation Process



# ESO Issues to manage risk

Issue ID	Issue Type	Priority	Project Name	Issue Description	Issue Discussion	Issue Stat	Date Opened	Due Date
	ESO							
<span>Issue Status: Open (4)</span>								
203	ESO Issue	2 - Medium Priority	R000791_Ford Dragon 1.5L I3 DTX B3B	Submit Lesson Learned for Guide Pace Retention. Consider actions taken to address 2-motion concern.		<input type="radio"/>	12-Oct-2017	
208	ESO Issue	2 - Medium Priority	R000791_Ford Dragon 1.5L I3 DTX B3B	Paton side load calculation required for tensioner.		<input type="radio"/>	12-Oct-2017	
202	ESO Issue	3 - High Priority	R000791_Ford Dragon 1.5L I3 DTX B3B	Witchat fatigue strength needs to be included in OHS&R and compared against measured rack loading in performance testing.		<input type="radio"/>	12-Oct-2017	
204	ESO Issue	1 - Low Priority	R000791_Ford Dragon 1.5L I3 DTX B3B	IV Calculation to be added to evidence for future benchmarking. (This was an item reviewed in the System OHS&R template and noted to not be covered in the Dragon [in])		<input type="radio"/>	12-Oct-2017	

# Issues types

## Pick an Issue Type

### List of Available Types

Select Type	Issue Type Name	Description:
<input type="radio"/>	Auros System Issue	Request to Emergent Systems
<input type="radio"/>	Decision	Utilize this Issue to seek Approval from an Engineering Director for a Design Rule Item that has RED or ORANGE status
<input type="radio"/>	ESO Issue	ESO open issues and tasks
<input checked="" type="radio"/>	Knowledge Update	Raise this issue the identify the need for new knowledge capture or the update of existing knowledge.

Raise Issue

Reset

# Teamboards

+ Add New Assessment    Group By: ESO Gate    Swimlanes Filter    Status Filter

ES01 (0)	ES02 (0)	ES03 (7)	ES04 (7)
		<b>APP-433</b> 433 ESOs for this program have been conducted on ICE as required. This ESO will capture design evidence in parallel as 52 08-Jun-2018 Assessment Complete	<b>APP-470</b> 470 Cam Drive System.PP.ESO4.Yellow 78 18-Jul-2018 Assessment Complete
		<b>AGP-437</b> 437 Main Guide.Primary.TT.ESO3 45 08-Jun-2018 Assessment Complete	<b>AGP-550</b> 550 Main Guide.unspecified.ESO4 68 18-Jul-2018 Assessment Complete

OVERVIEW | FILES | REPORTS | TASKS | ISSUES

+ Add New Issue    Group By: Issue Type

ESO Issue (12)	Knowledge Update (0)
<b>ESO Issue</b> 290 Chain tension predicted value exceeds rating. Creator : Atzberger, Brian(batzberger) Created On : 19-Sep-2017 Last Modified On : 10-Oct-2017	
<b>ESO Issue</b> 294 DVPR requires uploading to auros Creator : Atzberger, Brian(batzberger) Created On : 20-Sep-2017 Last Modified On : 10-Oct-2017	

ISSUES | ASSESSMENTS | MASTER ASSESSMENT | GANTT/CALENDAR

Project: R000791    Project ID - 391

Project Basic Elements

<b>Project Name</b>	R000791.SL.I3	<b>Creator</b>	Atzberger, Brian (batzberger)
<b>Date Created</b>	05-Sep-2017	<b>Last Update</b>	18-Dec-2017
<b>Project Description</b>	Variable Displacement (VDE) I2 Mode, Balancer in Block Variant (BSIB), Cast Iron Rack and Washer Tensioner		

Project Extended Elements

<b>Build Level</b>	PP, Pilot, SOP, TT, VP
<b>Customer</b>	
<b>Lead Engineering</b>	ETC
<b>Location</b>	
<b>Project Owners</b>	Atzberger, Brian(batzberger)

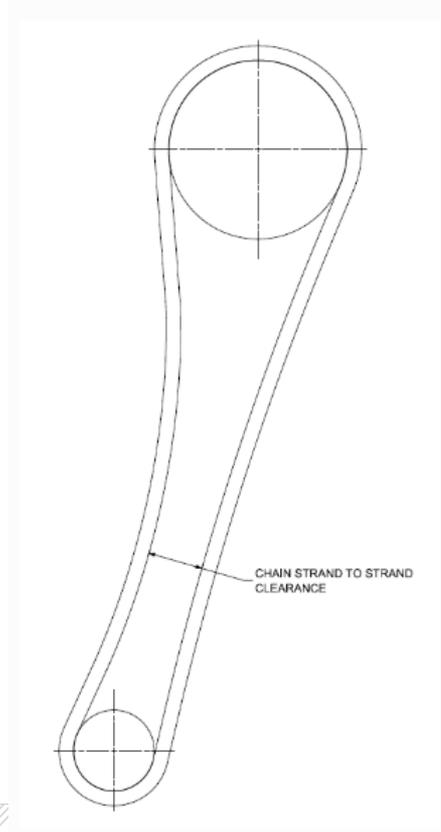
Project Attachments

Thumbnail	File/Link	Short Description	Uploaded By	Uploaded On
	filename_1505918	VP Build Image	Atzberger, Brian (batzberger)	20-Sep-2017 10:48:13

OVERVIEW | FILES | REPORTS | TASKS | ISSUES | ASSESSMENTS | MASTER ASSESSMENT | GANTT/CALENDAR

# Lookacross

Assessment ID	K-PAC Version	Conformance State	K-PAC Title	Value Table	Additional Information										
<a href="#">APP-CK673</a> (#1-0)	V 3 Latest	Conforms - Low Risk	Clearance: Chain Strand to Strand	<table border="1"> <tr> <td></td> <td>Strand-to-Strand Clearance at Worn Condition</td> </tr> <tr> <td>Value</td> <td>4</td> </tr> <tr> <td>Reported</td> <td>9.86</td> </tr> <tr> <td></td> <td>mm</td> </tr> <tr> <td></td> <td>Minimum</td> </tr> </table>		Strand-to-Strand Clearance at Worn Condition	Value	4	Reported	9.86		mm		Minimum	Confirm at maximum chain elongation, the slack strand does not risk hitting the tight strand.
	Strand-to-Strand Clearance at Worn Condition														
Value	4														
Reported	9.86														
	mm														
	Minimum														
<a href="#">APP-CK632</a> (#1-0)	V 3 Latest	Conforms - Low Risk	Clearance: Chain Strand to Strand	<table border="1"> <tr> <td></td> <td>Chain Strand-to-Strand Clearance at Worn Condition</td> </tr> <tr> <td>Value</td> <td>4</td> </tr> <tr> <td>Reported</td> <td>28.44</td> </tr> <tr> <td></td> <td>mm</td> </tr> <tr> <td></td> <td>Minimum</td> </tr> </table>		Chain Strand-to-Strand Clearance at Worn Condition	Value	4	Reported	28.44		mm		Minimum	Confirm at maximum chain elongation, the slack strand does not risk hitting the tight strand.
	Chain Strand-to-Strand Clearance at Worn Condition														
Value	4														
Reported	28.44														
	mm														
	Minimum														
<a href="#">APP-CK613</a> (#1-0)	V 3 Latest	Conforms - Low Risk	Clearance: Chain Strand to Strand	<table border="1"> <tr> <td></td> <td>Chain Strand-to-Strand Clearance at Worn Condition</td> </tr> <tr> <td>Value</td> <td>4</td> </tr> <tr> <td>Reported</td> <td>5.0</td> </tr> <tr> <td></td> <td>mm</td> </tr> <tr> <td></td> <td>Minimum</td> </tr> </table>		Chain Strand-to-Strand Clearance at Worn Condition	Value	4	Reported	5.0		mm		Minimum	Confirm at maximum chain elongation, the slack strand does not risk hitting the tight strand.
	Chain Strand-to-Strand Clearance at Worn Condition														
Value	4														
Reported	5.0														
	mm														
	Minimum														
	V 2	Conforms - Low Risk		<table border="1"> <tr> <td></td> <td>Chain Strand-to-Strand Clearance at Worn Condition</td> </tr> </table>		Chain Strand-to-Strand Clearance at Worn Condition	Confirm at maximum chain								
	Chain Strand-to-Strand Clearance at Worn Condition														



# Reporting



## Count Report

Report Criteria : [ Project Code= (R001139) ] [ \_TGDI\_2018 ] and ESO Level= (ESO2) and Status= (Evaluation Ready or Approval Ready or Assessment Complete) ]

Requirement Sub-Criteria: [ Primary Sub-Category = (Name) and Secondary Sub-Category =(None) ]

	Total No. Of Assessments Made	Assessments Made	N/SCOR	NE	Green	Yellow	Orange	Red	NA
<b>Total Program *</b>	774	766	0	8	534	16	0	0	216
BS ARM	55	55	0	0	32	1	0	0	22
CAM CAM GUIDE	62	61	0	1	30	0	0	0	31
CHN-T-107SER-6.35-5x4-64-N1	11	11	0	0	10	0	0	0	1
CHN-T-T107SER-6.35-4x4-170P-N1	11	11	0	0	10	0	0	0	1
CHN-T-T107SER-6.35-4x4-96-N1	11	11	0	0	10	0	0	0	1
Cartridge Tensioner for BS System	44	44	0	0	27	1	0	0	16
Crank Sprocket	22	22	0	0	18	0	0	0	4
GUIDE BS UPPER	62	62	0	0	32	1	0	0	29
GUIDE DOWN BS	62	55	0	7	23	0	0	0	32
MHT	66	66	0	0	49	3	0	0	14
OP Mechanical Tensioner	25	25	0	0	23	0	0	0	2
PRI. ARM	55	55	0	0	33	1	0	0	21
PRI. GUIDE	62	62	0	0	32	1	0	0	29
SPROCKET DRIVE BS 42T	22	22	0	0	19	0	0	0	3
SPROCKET IDLER BS EX 21T/Random	22	22	0	0	20	0	0	0	2
SPROCKET IDLER BS IN 24T	22	22	0	0	20	0	0	0	2
SPROCKET OIL PUMP 22T	21	21	0	0	16	0	0	0	5
Timing	139	139	0	0	130	8	0	0	1

Options

Save As Named Report

Add Report To 'My Stuff'

Share



# Content

- BorgWarner and Morse
- Where we had left it off 2 years ago
- What we have done in these 2 years
- Auros set up for Morse Engineering
- **Early successes**
- Moving forward

# Early Successes

- Software speed globally satisfactory
- Common Auros operating procedures
- More consistent engineering practices
- Updated/Higher quality knowledge base
- Engineering Community well trained and supported
- Auros Proponents at all levels: Engineers, Managers, Chief Engineers and Directors
- Momentum

# Content

- BorgWarner and Morse
- Where we had left it off 2 years ago
- What we have done in these 2 years
- Auros set up for Morse Engineering
- Early successes
- Moving forward

# Items to monitor moving forward

- Learning Curve in using the tool
- Impact of standardization/ formalization on organization
- Changes to the way we work
- Performance of software as use grows

# Expected results as we move into full production

- Effective project planning and coordination among project team members
- Consistent engineering practices and more rigorous designs
- Project issues brought early to management team
- Reviews better matching program timing
- High quality knowledge base
- Powerful internal benchmarking
- Rapid technical learning by more inexperienced RUs

# Next steps

- Turn off the SharePoint Design Guide
- Integrate with Morse Program Management Auros application
- DVPR and DMFEA documents into K-PACs
- Explore other opportunities for Auros within Morse Engineering systems and processes

# Thank you!



Combustion



Hybrid



Electric