Fixturlaser EVO

version 1.0

TRAINING MANUAL

VIBRALIGN

Unit 1

Introduction to Alignment

- Module 1-1: The VibrAlign Story
- Module 1-2: How We Train
- Module 1-3: The Machines We Align
- Module 1-4: Basic Shaft Alignment Concepts
- Module 1-5: Misalignment Forces
- Module 1-6: Media Resources

Module 1-1

The VibrAlign Story

[Objective]

At the end of this module, the student will be able to:

- Understand the VibrAlign mission, values, and why we exist.
- Know his/her instructor's background.

Module 1-1

The VibrAlign Story

[Lesson] The instructor will discuss the following:

- VibrAlign Story
- Realigning America

VIDEO

The VibrAlign Story

VIDEO

Realigning America

Module 1-2

How We Train

[Objective]

At the end of this module, the student will be able to:

- Understand the systematic approach to training.
- Understand why we train.

Module 1-2

How We Train

[Lesson] The instructor will discuss the following:

- How we train
- If shaft alignment is necessary

VIDEO

How We Train

VIDEO

Shaft Alignment Training, is it Necessary?

Module 1-3

The Machines We Align

[Objective]

At the end of this module, the student will be able to:

- Understand the types of machinery that is typically aligned.

Module 1-3

The Machines We Align

[Lesson] The instructor will demonstrate the following:

- Basics in alignment
- The machines that get aligned

Module 1-4

Basic Shaft Alignment Concepts

[Objective]

At the end of this module, the student will be able to:

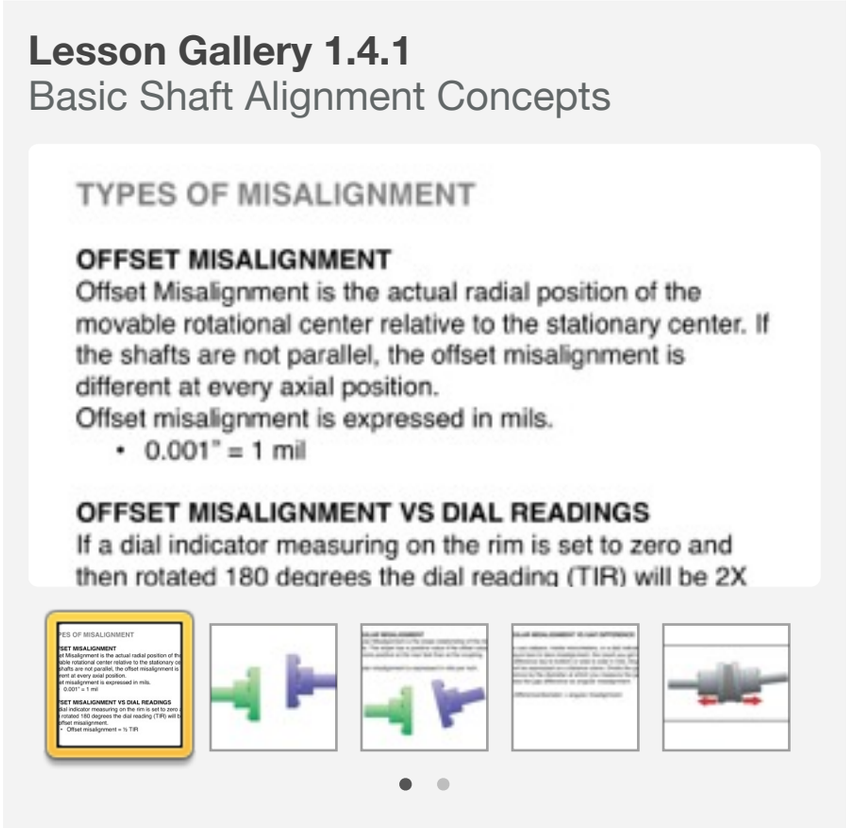
- Understand the rotational axis.
- Define shaft alignment.
- Be able to explain angular misalignment, gap difference, and offset misalignment.

Module 1-4

Basic Shaft Alignment Concepts

[Lesson] The lesson gallery & videos will be used to demonstrate:

- What is Offset Misalignment and what does it look like?
- What is Angular Misalignment and what does it look like?



VIDEO

Concepts of Shaft Alignment 1, the Basics

VIDEO

Concepts of Shaft Alignment 2, Offset and Angularity

Module 1-5

Misalignment Forces

[Objective]

At the end of this module, the student will be able to:

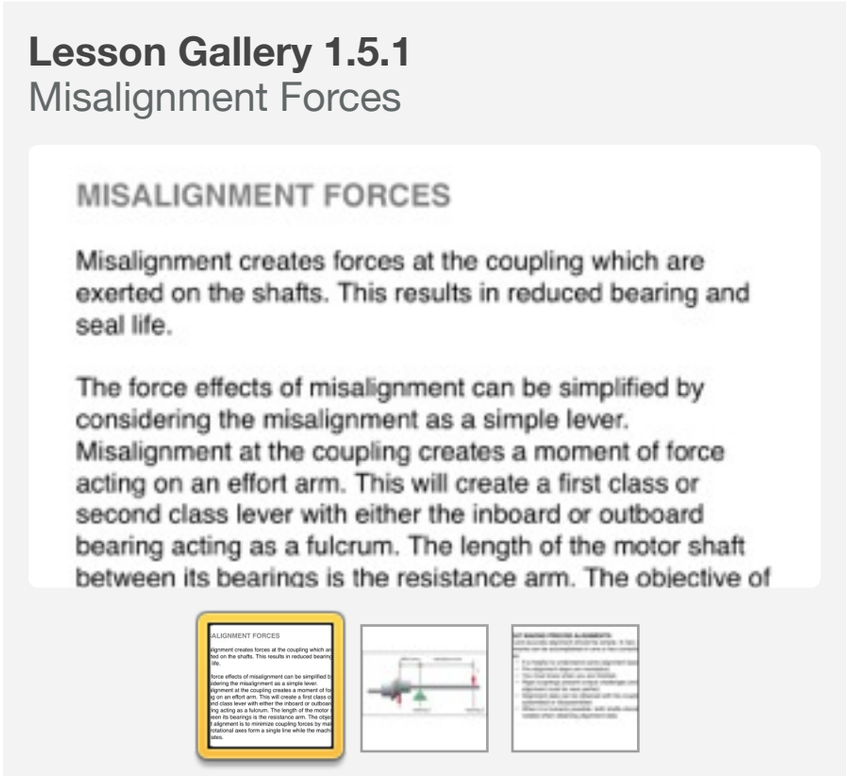
- Understand the importance of precise alignment.
- Understand the effects of Misalignment on couplings, bearings, seals, and machines.

Module 1-5

Misalignment Forces

[Lesson] The instructor will demonstrate the following:

- How misalignment forces cause coupling wear.
- How misalignment forces can cause bearing and seal failure.



Lesson Gallery 1.5.1
Misalignment Forces

MISALIGNMENT FORCES

Misalignment creates forces at the coupling which are exerted on the shafts. This results in reduced bearing and seal life.

The force effects of misalignment can be simplified by considering the misalignment as a simple lever. Misalignment at the coupling creates a moment of force acting on an effort arm. This will create a first class or second class lever with either the inboard or outboard bearing acting as a fulcrum. The length of the motor shaft between its bearings is the resistance arm. The objective of

Module 1-6

Introduction to Alignment Resources

VIDEO

The VibrAlign Story

VIDEO

Realigning America

VIDEO

How We Train

VIDEO

Shaft Alignment Training, is it Necessary?

VIDEO

Concepts of Shaft Alignment 1, the Basics

VIDEO

Concepts of Shaft Alignment 2, Offset and Angularity

Unit 2

Pre-Alignment

- Module 2-1: Rough Alignment
- Module 2-2: Obvious Soft Foot
- Module 2-3: Tightening Sequence
- Module 2-4: Final Soft Foot Checks
- Module 2-5: Other Pre-alignment Checks Listing
- Module 2-6: Media Resources

Module 2-1

Rough Alignment

[Objective]

At the end of this module, the student will be able to:

- Perform rough alignment of the shafts.

Module 2-1

Rough Alignment

[Lesson] The instructor will demonstrate the following:

- Using straight edge or scale to measure the vertical and horizontal offset misalignment.
- Using the above information to correct the rough misalignment.

VIDEO

Rough Alignment

PHOTO

Roughing In

Activity 2-1

Rough Alignment

1. Measure the vertical gap between the stationary and movable hubs using a straight edge and shims as a feeler gauge.
2. Correct the vertical misalignment by adding or removing shims to all four feet of the moveable machine.
3. Using the straight edge, measure and correct the horizontal alignment.

Discussion 2-1

Rough Alignment

1. Why do you perform rough alignment before attempting to precisely align machines?
2. Which direction should you typically rough align first - vertical or horizontal?
3. Should all machines be uncoupled before roughing in?

Module 2-2

Correcting Obvious Soft Foot

[Objective]

At the end of this module, the student will be able to:

- Correct obvious soft foot.
- Understand the different types of soft foot.

Module 2-2

Correcting Obvious Soft Foot

[Lesson] The instructor will demonstrate the following:

- How to identify and measure Obvious Soft Foot using shims or feeler gauges.
- How to properly correct Obvious Soft Foot using shims.

VIDEO

Elimination of Obvious Soft Foot

Activity 2-2

Correcting Obvious Soft Foot

1. With the bolts loose, use a pry bar, screwdriver, or pliers to look for shim piles that have less resistance than others. This indicates that the weight is not being distributed equally over all four feet.
2. Add shims as needed to make the resistance at each foot feel the same.
3. You may need to pry up on a foot to insert the corrective shim.

Discussion 2-2

Correcting Obvious Soft Foot

1. What are some possible causes of soft foot?
2. Why should you correct soft foot before attempting precision alignment?
3. Why should you rough align before checking for soft foot?

Module 2-3

Tightening Sequence

[Objective]

At the end of this module, the student will be able to:

- Understand the need to maintain a specific bolt tightening sequence.

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Module 2-3

Tightening Sequence

[Lesson] The instructor will demonstrate the following:

- Establishing a bolt tightening sequence.
- Taking three passes to achieve full torque.

VIDEO

Bolt Tightening

PHOTO

Bolt Tightening Order

Activity 2-3

Tightening Sequence

In three steps:

1. Tighten bolts, in order, hand tight.
2. Snug bolts, in order, to about 50% of final torque.
3. Tighten bolts, in order, to final torque.

Discussion 2-3

Tightening Sequence

1. Why should you follow a specific sequence when tightening bolts?

2. What benefits are gained by tightening the bolts down in a controlled, repeatable pattern?

Module 2-4

Final Soft Foot Corrections

[Objective]

At the end of this module, the student will be able to:

- Detect and correct final soft foot.
- Identify whether an “angular” correction is required.
- Explain how to correct angled foot.
- Control and minimize the effects of any remaining residual soft foot.

Module 2-4

Final Soft Foot Corrections

[Lesson] The instructor will demonstrate the following:

- Using a .OO2" (2 mils) shim to detect and correct any final soft foot.

Final Soft Foot Checks

Activity 2-4

Final Soft Foot Corrections

In this procedure you will:

1. Loosen one foot.
2. Measure for any remaining soft foot by checking several places under the foot with a 2-mil shim.
3. Re-tighten hold-down bolt.
4. Repeat process for the remaining three feet, tightening each foot back down after completion.

Discussion 2-4

Final Soft Foot Corrections

1. Why do we check for Final Soft Foot by loosening only one bolt at a time?
2. Why are two soft foot checks needed?
3. What benefits are gained by tightening the bolts down in a controlled, repeatable pattern?

Module 2-5

Other Pre-Alignment Checks Listing

[Objective]

At the end of this module, the student will have an understanding of additional pre-alignment checks.

- Check run out.
- Check for proper coupling hub separation.
- Measurement for pipe stress.

Module 2-5

Other Pre-Alignment Checks Listing

[Lesson] The instructor will discuss the following:

- Obvious safety inspections.
- Performing a visual inspection of the machine.
- Checking for run out on both coupling hubs and shafts.
- Measuring hub separation.
- Using dials to detect excessive pipe stress.

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Module 2-6

Pre-Alignment Resources

VIDEO
Rough Alignment

VIDEO
Elimination of Obvious Soft Foot

VIDEO
Bolt Tightening

VIDEO
Final Soft Foot Checks

PHOTO
Roughing In

PHOTO
Bolt Tightening Order

Unit 3

Basic Shaft Alignment

- Module 3-1: Demonstration of precision alignment #1
- Module 3-2: Demonstration of precision alignment #2
- Module 3-3: Student Practice #1
- Module 3-4: Student Practice #2
- Module 3-5: Introduction to Tolerances
- Module 3-6: Student Practice #3: Using 3600 RPM Tolerances

Unit 3

Basic Shaft Alignment

- Module 3-7: Student Practice #3- Uncoupled Alignment
- Module 3-8: Sampling Time
- Module 3-9: Vibration Filtering
- Module 3-10: Basic Shaft Alignment Media Resources

Module 3-1

Demonstration of Precision Alignment #1

[Objective]

At the end of this module, the student will be able to:

- Observe an entire precision alignment process.

Module 3-1

Demonstration of Precision Alignment #1

[Lesson] The instructor will demonstrate the following:

- Setting up the EVO.
- Starting the horizontal alignment program.
- Aiming the lasers.
- Entering machine dimensions.

VIDEO

Touch-Tip: Set Up

VIDEO

Touch-Tip: Entering Dimensions and Setting Tolerances

VIDEO

Touch-Tip: Express Mode Alignment

BLOG POST

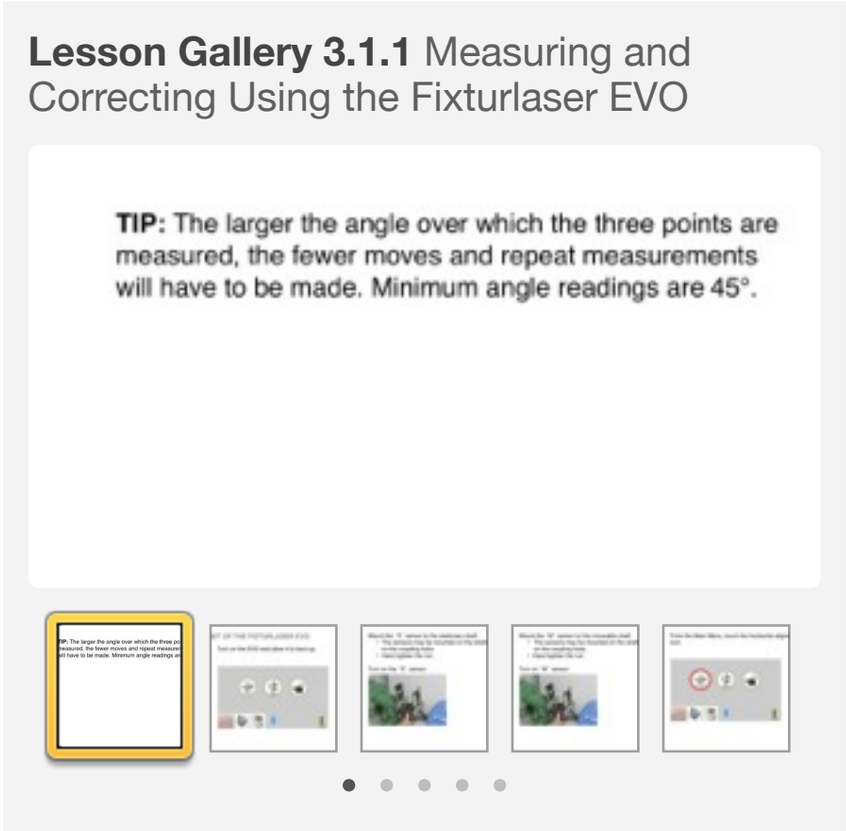
The Importance of Proper Alignment Technique and Being Aware of movement

Module 3-1

Demonstration of Precision Alignment #1

[Lesson cont'd] The instructor will demonstrate the following:

- Measuring misalignment.
- Making a Verti-Zontal Compound Move.
- Remeasuring alignment.
- Saving results.



Discussion 3-1

Demonstration of Precision Alignment #1

1. Of the four dimensions which do you think are the most important to measure correctly?
2. True or false, the sensors should be mounted as closely together as possible.
3. At what point do the lasers become visible and begin measurement?

Module 3-2

Demonstration of Precision Alignment #2

[Objective]

At the end of this module, the student will be able to:

- Assist in an entire precision alignment process.

Module 3-2

Demonstration of Precision Alignment #2

[Lesson] The instructor will demonstrate the following:

- Setting up the EVO.
- Starting the horizontal alignment program.
- Aiming the lasers.
- Entering machine dimensions.
- Measuring misalignment.

Module 3-2

Demonstration of Precision Alignment #2

[Lesson cont'd] The instructor will demonstrate the following:

- Making a Verti-Zontal Compound Move.
- Monitoring for coupling looseness.
- Remeasuring alignment.
- Saving results.

VIDEO

Touch-Tip: Set Up

VIDEO

Touch-Tip: Entering Dimensions and Setting Tolerances

VIDEO

Touch-Tip: Express Mode Alignment

BLOG POST

The Importance of Proper Alignment Technique and Being Aware of movement

Discussion 3-2

Demonstration of Precision Alignment #2

1. How important is it to save the “as found” data?
2. Is it important to aim the lasers perfectly?
3. On the results screen, which group of numbers is most important, those at the coupling, or those at the feet?
4. How do you know if you’ve maintained proper backlash during the measurement process?

Module 3-3

Student Practice #1

[Objective]

At the end of this module, the student will be able to:

- Perform an entire precision alignment using the with a tolerance of 1800 rpm.

Module 3-3

Student Practice #1 Lesson

[Lesson] The instructor will observe and assist you in performing a complete alignment.

Activity 3-3

Student Practice #1

1. Remove the shims from the moveable element.
2. Perform your pre-alignment checks and correction.
3. Perform a precision alignment for an 1800 rpm machine.
4. Re-measure and document the results.

Discussion 3-3

Student Practice #1

1. What do the colors of the coupling icons represent?
2. What is a primary benefit of using the Verti-Zontal process?
3. Did the alignment demonstrator move in the manner and direction you expected?

Module 3-4

Student Practice #2

[Objective]

At the end of this module, the student will be able to:

- Perform an entire precision alignment process with a tolerance of 1800 rpm using the Tri-Point Method.

Module 3-4

Student Practice #2

- [Lesson] The instructor will observe and assist you in the following:
- Perform a precision alignment for a 1800 rpm machine using the Tri-Point Method.
- Re-measure and document the results.

BLOG POST
How to Minimize the Effects of Backlash When Measuring Misalignment

BLOG POST
Aligning Uncoupled Machines

BLOG POST
Shaft Alignment With A Fluid Coupling

BLOG POST
Choosing the Best Way to Mount the Sensors of Your Laser Alignment Tool

BLOG POST
From the Mailbag: Mounting to Coupling Hubs

BLOG POST
Flexible Couplings and Flexible Shafts

Activity 3-4

Student Practice #2

1. Remove the shims from the moveable element.
2. Perform your pre-alignment checks and correction.
3. Perform a precision alignment for an 1800 rpm machine using the Tri-Point method.
4. Re-measure and document the results.

Discussion 3-4

Student Practice #2

1. Is it required to use clock positions for measurements when using the EVO?
2. Why does it only require three measurements?

Module 3-5

Introduction to Tolerances

[Objective]

At the end of this module, the student will be able to:

- Understand the reason for alignment tolerances.

Module 3-5

Introduction to Tolerances

[Lesson] The instructor will demonstrate the following:

- Changing the alignment tolerance from an 1800 rpm tolerance to a 3600 rpm tolerance.

Lesson Gallery 3.5.1 Tolerances

1) TOLERANCES

You were taught to enter the machinery RPM after you enter your dimensions. If you discover that you have entered the wrong RPM, you can change it without having to start over.

1.1 To change tolerance, touch the Tools icon, then select the Change Tolerance icon. Touch the box next to the correct machine speed.

BLOG POST

Who Decides Shaft Alignment Tolerances?

BLOG POST

Tolerances vs. Coupling Tolerances

ARTICLE

Don't Look at Your Feet

PHOTO

The Zone of Good Alignment

VIDEO

Touch-Tip: Entering Dimensions and Setting Tolerances

Activity 3-5

Introduction to Tolerances

1. Remove the shims from the moveable element.
2. Perform your pre-alignment checks and correction.
3. Use the EVO to select 3600 rpm tolerance and enter the machine dimensions.
4. Leave the EVO on and in the shaft alignment application.

Discussion 3-5

Introduction to Tolerances

1. Why are alignment tolerances specified?
2. Do you know your company's alignment tolerances?
3. Why is alignment to zero impractical?

Module 3-6

Prac #3: Using 3600 RPM Tolerances

[Objective]

At the end of this module, the student will be able to:

- Measure the "as found" alignment data from the roughing in process and save the data.
- Perform an entire precision alignment process with a tolerance of 3600 rpm.
- Save the final "as left" alignment data.

Module 3-6

Prac #3: Using 3600 RPM Tolerances

[Lesson] The instructor will observe and assist in performing a 3600 rpm alignment.

BLOG POST

Who Decides Shaft Alignment Tolerances?

BLOG POST

Tolerances vs. Coupling Tolerances

ARTICLE

Don't Look at Your Feet

PHOTO

The Zone of Good Alignment

Activity 3-6

Prac #3: Using 3600 RPM Tolerances

1. Complete the alignment, using a tolerance of 3600 rpm.
2. Re-measure and document the “as left” data.

Discussion 3-6

Prac #3: Using 3600 RPM Tolerances

1. What are some challenges of aligning to a 3600 rpm tolerance?
2. Are shim stack thicknesses more critical at 3600 rpm?
3. What would be the importance of saving both the “as found” and “as left” data?
4. How can the Zone of Good Alignment be used to determine acceptable foot values?

Module 3-7

Practice #4: Uncoupled Alignment

[Objective]

At the end of this module, the student will be able to:

- Complete a precision alignment of an uncoupled machine.
- Have a better understanding of the inclinometer values on the EVO, and how they can be utilized.

Module 3-7

Practice #4: Uncoupled Alignment

[Lesson] The instructor will demonstrate the following:

- Performing an uncoupled precision alignment.

BLOG POST

Aligning Uncoupled Machines

Activity 3-7

Practice #4: Uncoupled Alignment

1. Remove the shims from the moveable element.
2. Perform the pre-alignment steps.
3. Leave the coupling insert out.
4. Measure misalignment and save the “as found” data.
5. Complete the alignment, using a tolerance of 1800 rpm.
6. Re-measure and document the “as left” data.

Discussion 3-7

Practice #4: Uncoupled Alignment

1. When would it be preferable to perform an uncoupled alignment?
2. Should the alignment values change once the coupling is assembled?
3. How close should the inclinometer values be kept when performing an uncoupled alignment?

Module 3-8

Sampling Time

[Objective]

At the end of this module, the student will be able to:

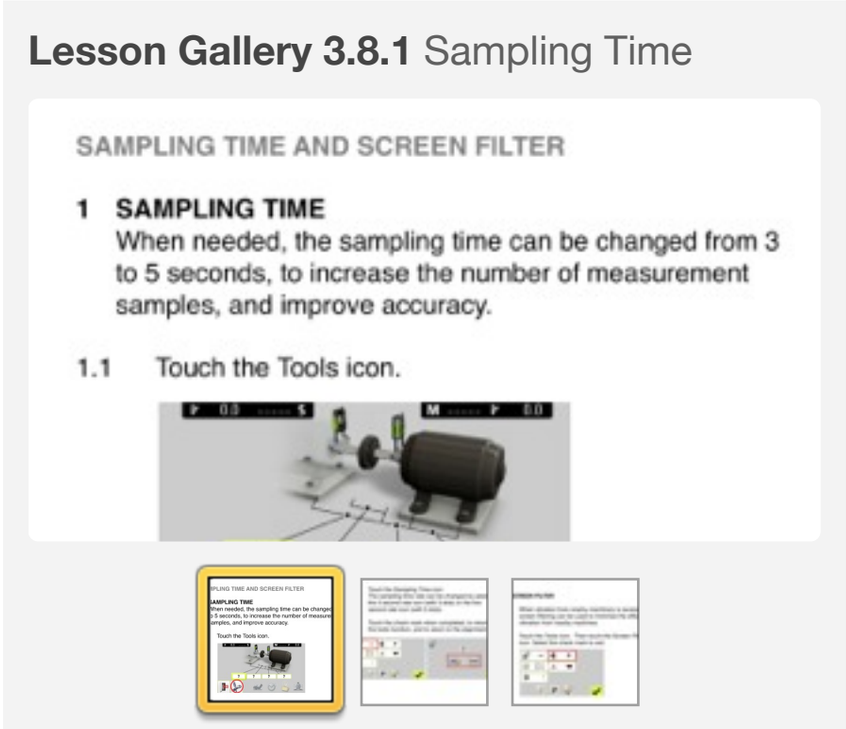
- Understand and utilize the Sampling Time and Screen Filtering functions of the Fixturlaser EVO.

Module 3-8

Sampling Time

[Lesson] The instructor will demonstrate the following:

- Changing the Sampling Time to 5 seconds



Lesson Gallery 3.8.1 Sampling Time

SAMPLING TIME AND SCREEN FILTER

1 SAMPLING TIME

When needed, the sampling time can be changed from 3 to 5 seconds, to increase the number of measurement samples, and improve accuracy.

1.1 Touch the Tools icon.

BLOG POST

Is Vibration Interfering With Your Precision Shaft Alignment?

BLOG POST

Non-repeatability, A Little movement Can Cause A Lot of Headaches

Discussion 3-8

Sampling Time

1. How can increasing the sampling time improve repeatability?
2. How would you best determine when the sampling time should be increased?

Module 3-9

Vibration Filtering

[Objective]

At the end of this module, the student will be able to:

- Understand the use of the Screen Filter, and when to utilize it.

Module 3-9

Vibration Filtering

[Lesson] The instructor will demonstrate the following:

- Use of the Screen Filter.

Discussion 3-9

Vibration Filtering

1. What is the purpose of the Screen Filter?
2. What is the best method of determining the influences of external vibration on alignment data?
3. Should the Screen Filter be used for every alignment? Why or why not?
4. Explain the difference in the Screen Filter and the Sampling Time.

Module 3-10

Basic Shaft Alignment Resources

BLOG POST

The Importance of Proper Alignment Technique and Being Aware of movement

BLOG POST

How to Minimize the Effects of Backlash When Measuring Misalignment

BLOG POST

Aligning Uncoupled Machines

BLOG POST

Shaft Alignment With A Fluid Coupling

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VIBRALIGN

Module 3-10

Basic Shaft Alignment Resources

BLOG POST

Is Vibration Interfering With Your Precision Shaft Alignment?

ARTICLE

Don't Look at Your Feet

PHOTO

The Zone of Good Alignment

Unit 4

Alignment Problems and Solutions

- Module 4-1: When Things Go Wrong- looseness, backlash
- Module 4-2: Soft Foot Revisited (including angled foot)
- Module 4-3: Student Practice #6: Solving Base Bound/Bolt Bound Issues
- Module 4-4: Media Resources

Module 4-1

Backlash and Looseness

[Objective]

At the end of this module, the student will be able to:

- Identify issues associated with coupling backlash and system looseness.

Module 4-1

Backlash and Looseness

[Lesson] The instructor will demonstrate the following:

- How backlash and looseness affect readings
- How to identify and control backlash and looseness
- Methods to control backlash

BLOG POST

How To Minimize the Effects of Coupling Backlash When Measuring Misalignment

BLOG POST

Troubleshooting Looseness During Shaft Alignment.

VIDEO

Backlash

Activity 4-1

Backlash and Looseness

1. Mount the sensors as you would in a normal alignment
2. Start up the EVO, and select horizontal alignment.
3. Select 1800 RPM and follow through to the alignment screen, stop.
4. Enter dimensions and follow through to the alignment screen, stop.
5. At this point, take note of the inclinometer readings at the top of the EVO display screen.

Activity 4-1

Backlash and Looseness

6. Rotate the movable shaft back and fourth causing backlash in the coupling.
7. Take note of the inclinometer readings and how they change.
8. Take note of any warnings that may be displayed on the screen.

Discussion 4-1

Backlash and Looseness

1. When the shafts are rotated, how did the inclinometer readings change?
2. When backlash was introduced into the coupling, were there any warnings displayed on the screen?
3. How would you correct the warning situation?
4. What are some methods for preventing backlash?

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Module 4-2

Soft Foot Revisited

[Objective]

At the end of this module, the student will be able to:

- Measure and correct soft foot using the Fixturlaser EVO.

Module 4-2

Soft Foot Revisited

[Lesson] The instructor will demonstrate using the EVO Soft Foot App.

Lesson Gallery 4.2.1 Softfoot Revisited

1) SOFTCHECK™

The SoftCheck™ program can be accessed from the horizontal shaft alignment app once the measurement dimensions have been entered.

1.1 From the measurements screen, select the Soft Check™ icon.

VIDEO

Pre-alignment Steps for Shaft Alignment

BLOG POST

"Mic" Your Shims

BLOG POST

Small Details Make A Big Difference in Shaft Alignment

BLOG POST

Defining Level vs. Flat

Activity 4-2

Soft Foot Revisited

1. Using the process demonstrated, measure and correct soft foot on your demonstrator using the EVO Soft Foot App.

Discussion 4-2 Soft Foot Revisited

1. What do the numbers represent?
2. How could all four feet be soft?
3. What would be the reason that adding a shim would cause little or no change when re-measured?
4. How could you resolve this problem?
5. What effect does “angled” softfoot have on the alignment?

Module 4-3

Base Bound/Bolt Bound Issues

[Objective]

At the end of this module, the student will be able to:

- Discuss alternative solutions to limited movement of machines in both vertical and horizontal planes.
- Determine solutions for dealing with Base Bound/Bolt Bound issues and correct.

Module 4-3

Base Bound/Bolt Bound Issues Lesson

[Lesson] The instructor will demonstrate the following:

- What Base Bound/Bolt Bound conditions are
- Alternative moving methods

BLOG POST

Base-Bound/ Bolt-Bound Math

BLOG POST

Is it okay to undercut bolts?

BLOG POST

Take a Step Back During Your Shaft Alignment

BLOG POST

What if You Had to Leave a Machine Slightly Misaligned?

Activity 4-3

Base Bound/Bolt Bound Issues

1. Instructor will set the alignment demonstrator up in a Base Bound or Bolt Bound Condition.
2. Students will perform initial alignment measurements.
3. Instructor will guide students through alternative solutions.

Discussion 4-3

Base Bound/Bolt Bound Issues

1. What are some methods in which a Bolt Bound condition is traditionally solved?
2. Can a stationary machine sometimes be moved slightly?

Module 4-4

Alignment Problems and Solutions

Resources

BLOG POST

How To Minimize the Effects of Coupling Backlash When Measuring Misalignment

BLOG POST

Troubleshooting Looseness During Shaft Alignment.

VIDEO

Pre-alignment Steps for Shaft Alignment

BLOG POST

"Mic" Your Shims

BLOG POST

Small Details Make A Big Difference in Shaft Alignment

BLOG POST

Base-Bound/ Bolt-Bound Math

BLOG POST

Is it okay to undercut bolts?

BLOG POST

Take a Step Back During Your Shaft Alignment

BLOG POST

What if You Had to Leave a Machine Slightly Misaligned?

Unit 5

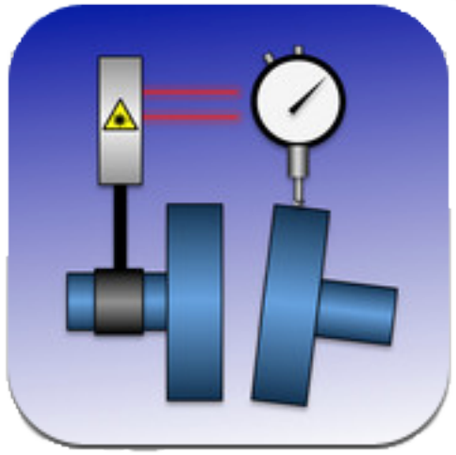
VibrAlign Resources

- Module 5-1: Mobile Applications
- Module 5-2: The Alignment Blog
- Module 5-3: VibrAlign YouTube Channel
- Module 5-4: Realigning America
- Module 5-5: The Alignment Resource Center
- Module 5-6: T-mail Training Newsletter
- Module 5-7: Training Website

VIBRALIGN

Module 5-1

Mobile Apps: iOS and Android



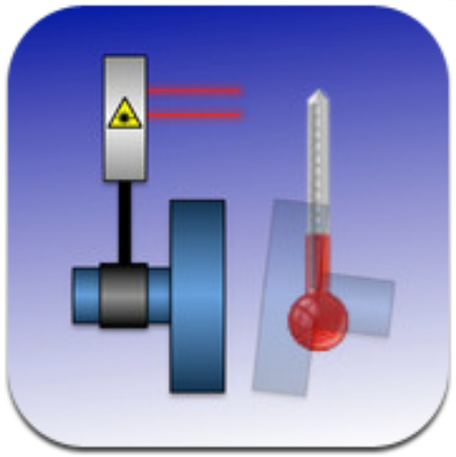
Gallery 5.1 Laser-Dials App

Gallery 5.2 Therm Align App

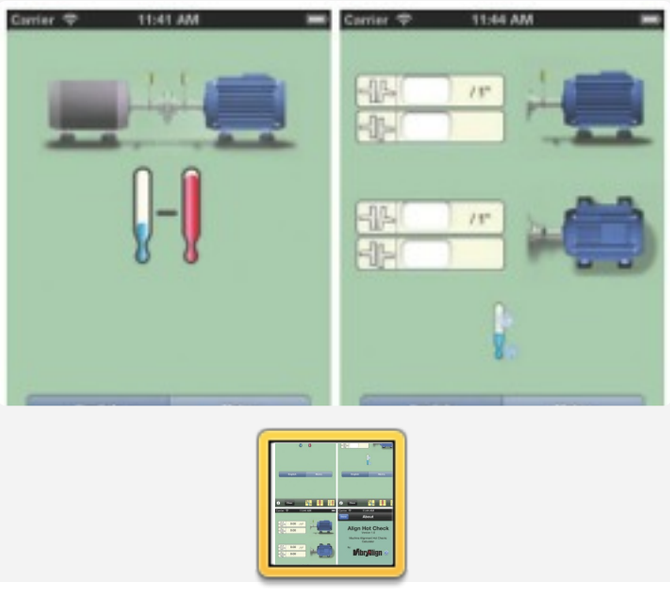
Gallery 5.3 Align Terms App

Module 5-1

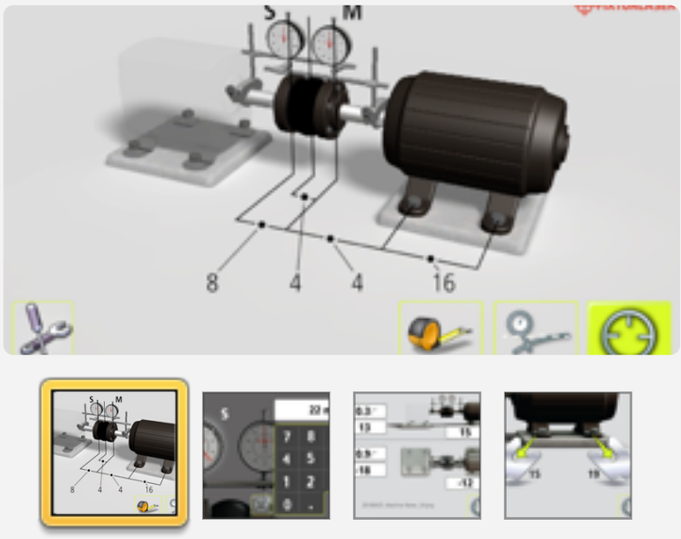
Mobile Apps: iOS and Android



Gallery 5.4 Align Hot Check



Gallery 5.5 Fixturlaser Dials



Module 5-2

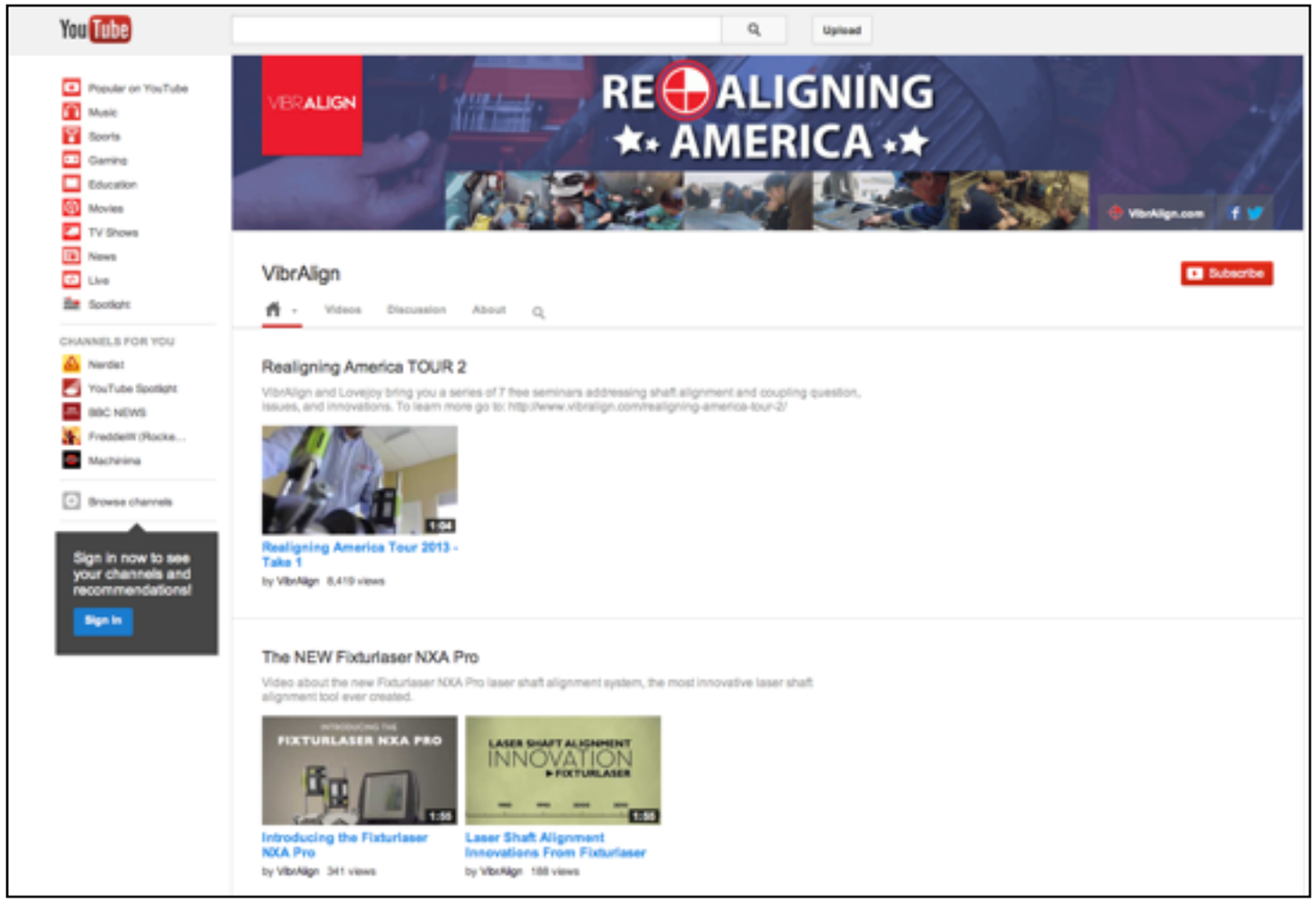
The Alignment Blog

Our goal here is to provide informative, relevant articles on the challenges of aligning industrial equipment. We'll talk about gathering meaningful alignment data, making the difficult moves, common pitfalls, etc. We'll present real-world situations with data we've collected in the field and hopefully get some good discussions going. This will also be another place to keep up with innovations and product releases from Fixturlaser.

VIBRALIGN

Module 5-3

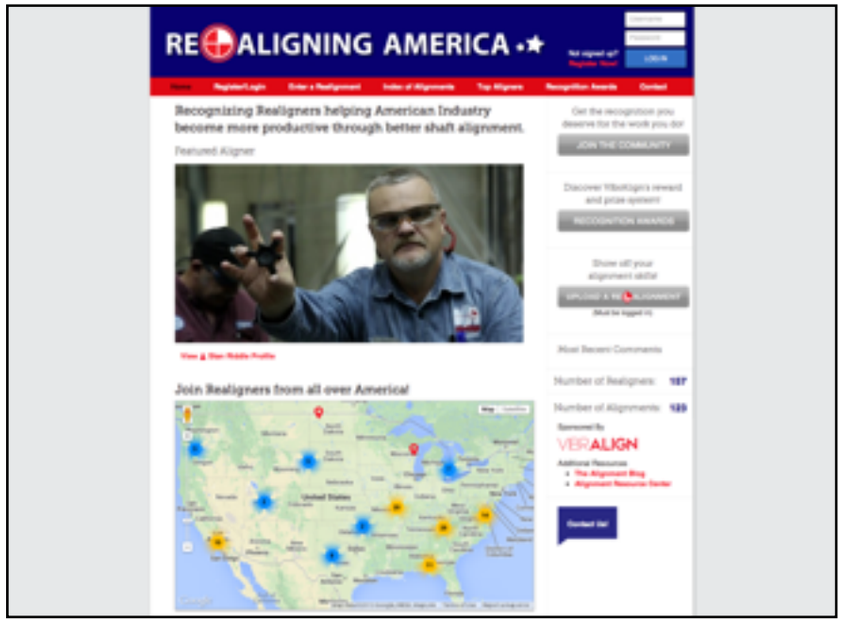
VibrAlign YouTube Channel



http://www.youtube.com/user/VibrAlign

Module 5-4

Realigning America



Realigning America signifies a nationwide community of aligners that can provide a sense of support and camaraderie among colleagues. Through Realigning America, your work is made public to the world. This exposure offers a gateway for aligner prominence and notability within the community of Realigning America. Posted alignments instantly create a learning environment that fosters collaboration and education.

VIBRALIGN

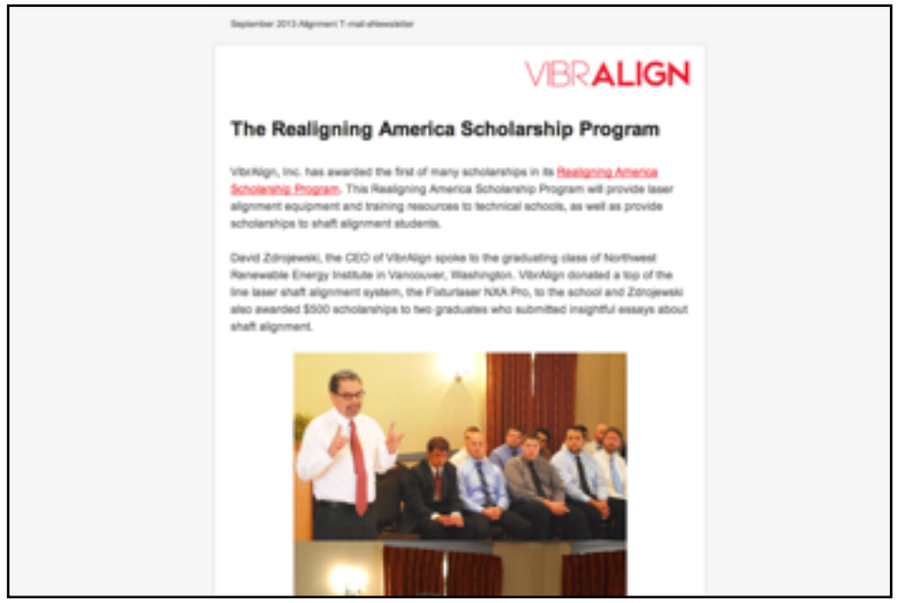
Module 5-5

The Alignment Resource Center

All of the VibrAlign collection of alignment materials is now being collected and made available on the Alignment Resource Center. The site not only provides access to articles and videos about alignment, it also provides access to all the posts from The Alignment Blog. All the content is organized and searchable.

Module 5-6

T-mail Training Newsletter



VIBRALIGN

The Realigning America Scholarship Program

VibrAlign, Inc. has awarded the first of many scholarships in its Realigning America Scholarship Program. This Realigning America Scholarship Program will provide laser alignment equipment and training resources to technical schools, as well as provide scholarships to shaft alignment students.

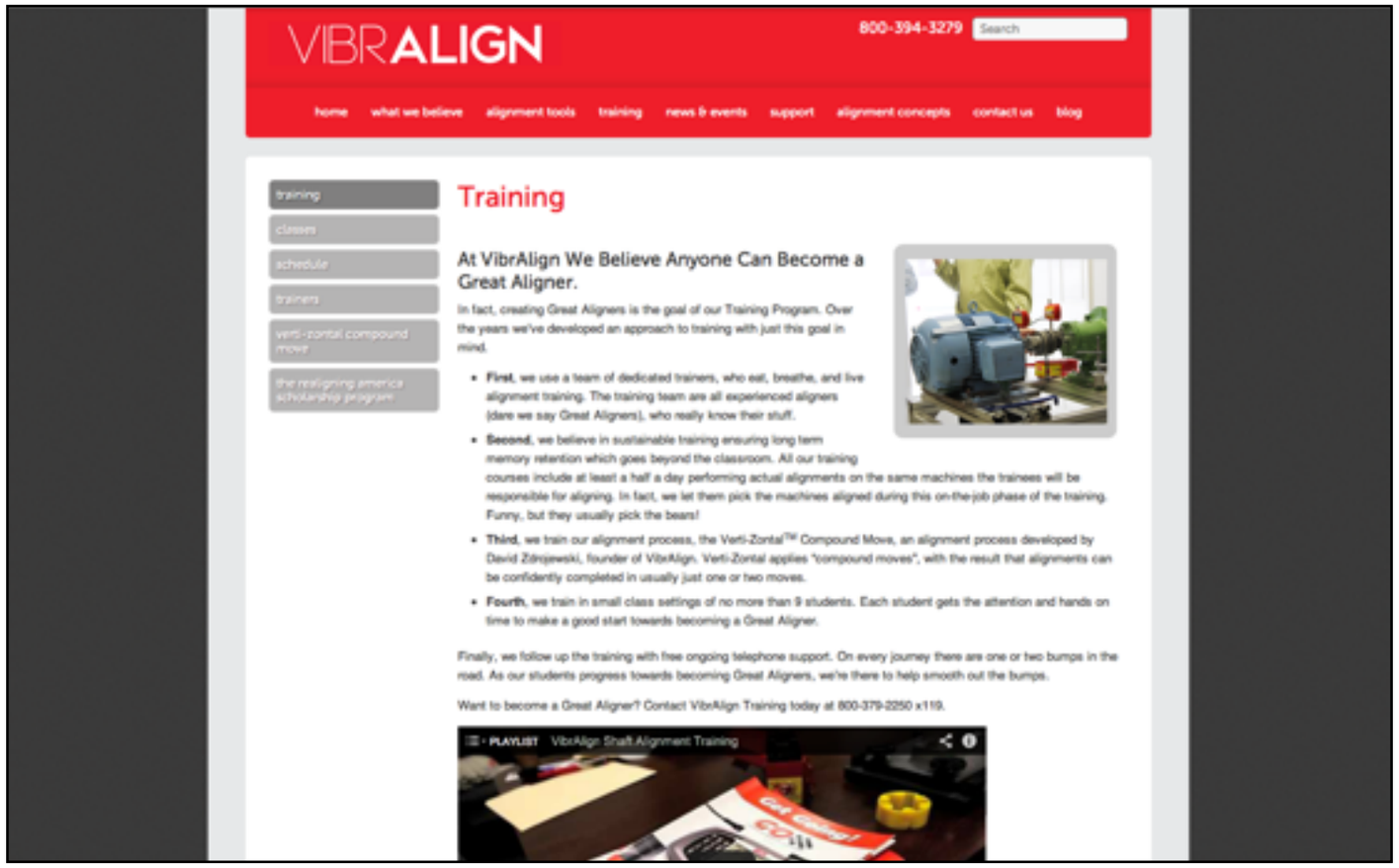
David Zdrojewski, the CEO of VibrAlign spoke to the graduating class of Northwest Renewable Energy Institute in Vancouver, Washington. VibrAlign donated a top of the line laser shaft alignment system, the Fixturlaser NXA Pro, to the school and Zdrojewski also awarded $500 scholarships to two graduates who submitted insightful essays about shaft alignment.

The eNewsletter features advice from VibrAlign's alignment experts, and articles on technical topics, as well as answers to questions from T-Mail subscribers and VibrAlign customers. T-Mail will also keep subscribers up to date on product updates, new software including apps, training classes, and relevant content available through other publications such as VibrAlign's blog and website.

VIBRALIGN

Module 5-7

Training Website



http://www.vibralign.com/Training

Unit 6

Operating Modes, Measurement Units, & File Management

- Module 6-1: Screen Flip
- Module 6-2: Power Supply and Charging
- Module 6-3: Measurement Units
- Module 6-4: Bluetooth Pairing
- Module 6-5: File Management
- Module 6-6: EVO Care and Handling

Module 6-1

Screen Flip™

[Objective]

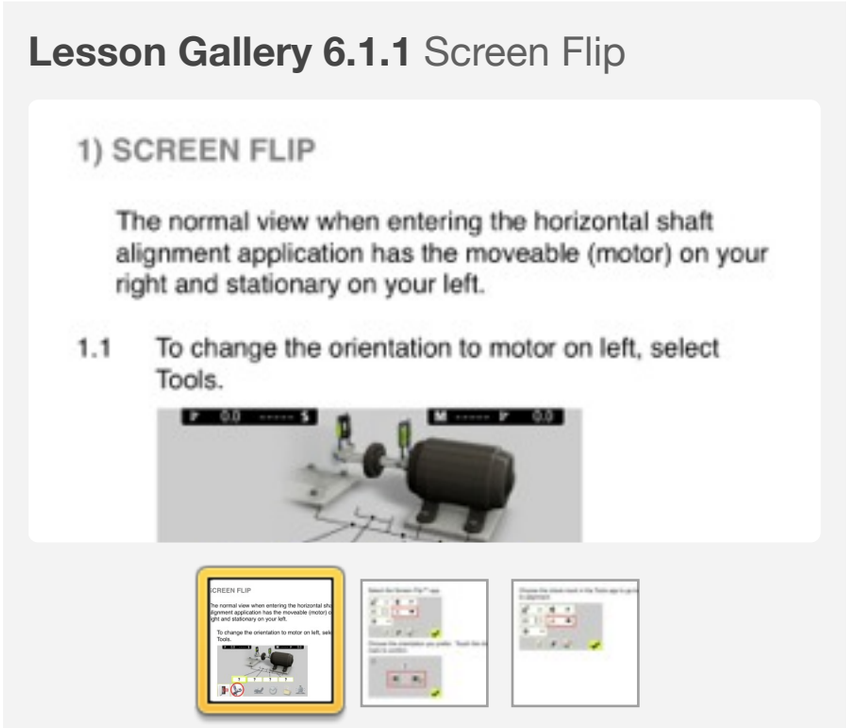
At the end of this module, the student will be able to:

- Understand the Screen Flip function and how to utilize it.

Module 6-1

Screen Flip™

[Lesson] The instructor will demonstrate the Screen Flip function.



VIDEO

Touch-Tip: Screen Flip

Activity 6-1

Screen Flip™

1. Student rotates EVO screen using Screen Flip function.

Discussion 6-1

Screen Flip™

1. What are the benefits of using the Screen Flip Function of the EVO?

Module 6-2

Power Supply and Charging

[Objective]

At the end of this module, the student will be able to:

- Understand the charging functions of the EVO.

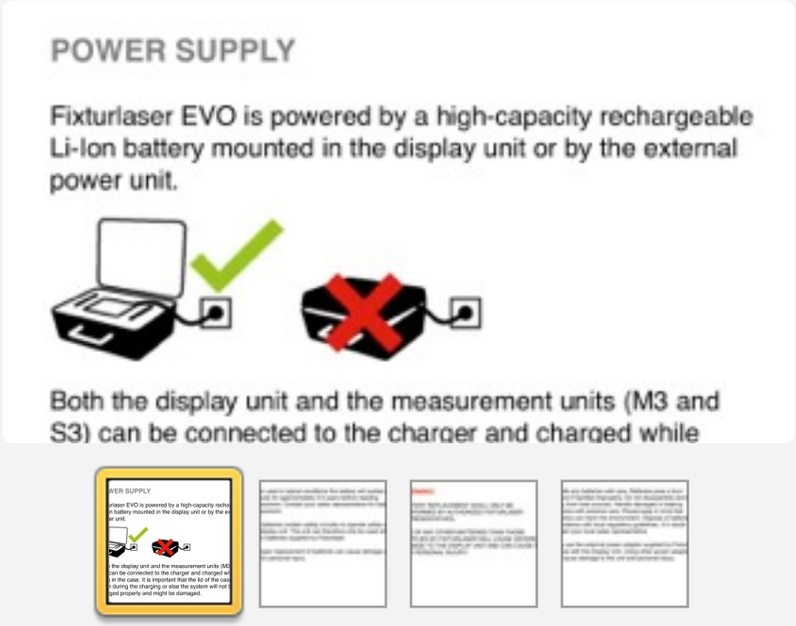
Module 6-2

Power Supply and Charging

[Lesson] The instructor will demonstrate the following:

- Battery life and maintenance.
- Low battery indicator.
- Charging cycle and indicator.
- How to charge the display unit and Bluetooth transmitters.

Lesson Gallery 6.2.1 Power Supply and Charging



Discussion 6-2

Power Supply and Charging

1. Should I ever remove the charging cables from the EVO case?
2. Can I check the charge level of the batteries while the EVO is turned off?

Module 6-3

Measurement Units

[Objective]

At the end of this module, the student will be able to:

- Change measurement units between Imperial and Metric Settings.

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Module 6-3

Measurement Units

[Lesson] The instructor will demonstrate the following:

- Changing between Imperial and Metric units.

Discussion 6-3

Measurement Units

1. From the alignment report, how can I easily tell if the EVO is set up to measure in inches or millimeters?

Module 6-4

Bluetooth Pairing

[Objective]

At the end of this module, the student will be able to:

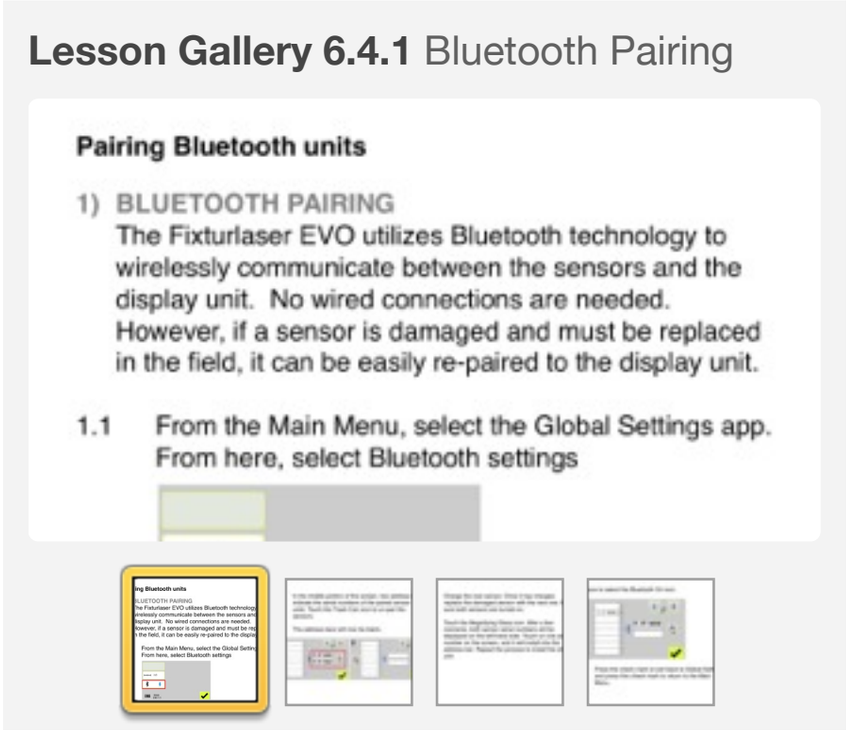
- Know how and when to re-pair the Bluetooth Transmitters

Module 6-4

Bluetooth Pairing

[Lesson] The instructor will demonstrate the following:

- Un-pairing and re-pairing the Bluetooth transmitters.
- When the pairing process would be necessary.



Lesson Gallery 6.4.1 Bluetooth Pairing

Pairing Bluetooth units

1) BLUETOOTH PAIRING

The Fixturlaser EVO utilizes Bluetooth technology to wirelessly communicate between the sensors and the display unit. No wired connections are needed. However, if a sensor is damaged and must be replaced in the field, it can be easily re-paired to the display unit.

1.1 From the Main Menu, select the Global Settings app. From here, select Bluetooth settings

Discussion 6-4

Bluetooth Pairing

1. Is there typically any reason to un-pair the Bluetooth transmitters?

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Module 6-5

File Management

[Objective]

At the end of this module, the student will be able to:

- Copy alignment data from the EVO Display Unit to a PC.
- View alignment data from within the EVO memory.

Module 6-5

File Management

[Lesson] The instructor will demonstrate the following:

- Connecting the EVO to a PC.
- Transferring alignment date into a PC.
- Opening an existing alignment in the EVO memory.

Lesson Gallery 6.5.1 File Management

FILE MANAGEMENT

The Fixturlaser EVO contains a 500 megabyte hard drive capable of storing over 1200 alignment files. Alignment data can be easily transferred over to a PC via use of the USB to USB mini cable.

1.1 Attach the USB mini connector to the Fixturlaser EVO.

1.2 Turn the Fixturlaser EVO on, and leave on Main Menu. Plug the USB connector into a USB slot on the PC. The "Connected to PC" icon will now be displayed on the Fixturlaser EVO screen. Touch this

Discussion 6-5

File Management

1. What would be a good way to organize folders for your facility?
2. Can a file or folder be moved back into the EVO from a PC.
3. Is a special program needed to transfer files and folders from the EVO onto a PC?

Module 6-6

Care and Handling

[Objective]

At the end of this module, the student will be able to:

- Understand the proper care, handling and cleaning of the Fixturlaser EVO Pro Alignment System.

Module 6-6

Care and Handling

[Lesson] The instructor will discuss the following:

- EVO Storage case.
- EVO display unit, M & S Sensors IP65 rating.
- Touch screen durability.
- Temperature and humidity working range.
- Proper cleaning of display unit screen, detector and laser "windows" using a soft cloth or Q-tip not paper products. Use Alcohol only.

Discussion 6-6

Care and Handling

1. Can I clean my EVO with an ammonia based cleaner?
2. Do I need to protect the EVO Display Unit and Sensors from rain?
3. What should I use to clean the laser and detector openings on the sensors, paper towels or a Q-tip?

Unit 7

Advanced Shaft Alignment

- Module 7-1: Thermal Growth & Dynamic Movement
- Module 7-2: Entering Thermal Targets at the Feet
- Module 7-3: Entering Thermal Targets at the Coupling
- Module 7-4: Student Practice #7 using Thermal Targets

Unit 7

Advanced Shaft Alignment

- Module 7-5: Vertical Alignment
- Module 7-6: Machine Defined Data
- Module 7-7: Media Resources*

Module 7-1

Thermal Growth & Dynamic Movement

[Objective]

At the end of this module, the student will be able to:

- Explain why some machines are intentionally misaligned.
- Discuss the difference between thermal growth and thermal targets.
- Define Dynamic Movement.

Module 7-1

Thermal Growth & Dynamic Movement

[Lesson] The instructor will demonstrate the following:

- Causes of thermal growth.
- How thermal growth affects.
- Necessity of accurate thermal growth targets.

BLOG POST

Shaft Alignment Thermal Growth Targets- When You Don't Know

BLOG POST

Checking Your Thermal Targets

BLOG POST

How Does Calculating Your Own Alignment Targets Work?

BLOG POST

Thermal Growth: What's So Hot About It?

BLOG POST

Thermal Growth Compensation- Growth Versus Targets

BLOG POST

Should Thermal Growth Affect Angular Misalignment?

Discussion 7-1

Thermal Growth & Dynamic Movement

1. What are targets?
2. Can thermal changes affect both elements?
3. Can you have both vertical and horizontal changes?
4. What is the most common cause of dynamic movement?

Module 7-2

Entering Thermal Targets at the Feet

[Objective]

At the end of this module, the student will be able to:

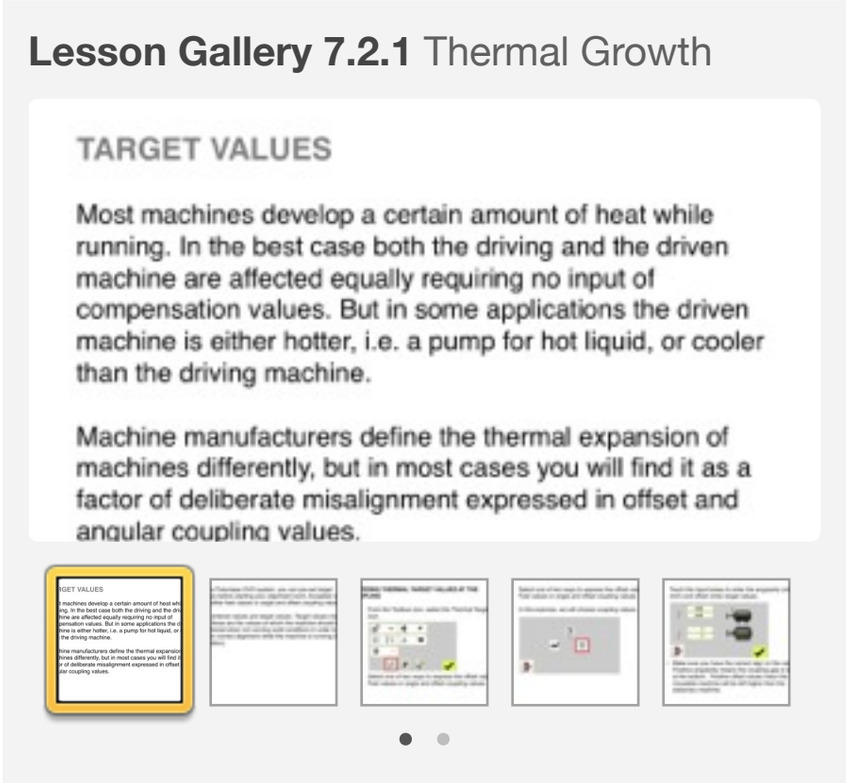
- Enter thermal targets at the feet of the moveable and/or stationary machine(s).

Module 7-2

Entering Thermal Targets at the Feet

[Lesson] The instructor will demonstrate the following:

- Select the Thermal Targets icon.
- Choose the foot icon.



BLOG POST

Shaft Alignment Thermal Growth Targets- When You Don't Know

BLOG POST

Checking Your Thermal Targets

BLOG POST

How Does Calculating Your Own Alignment Targets Work?

BLOG POST

Thermal Growth: What's So Hot About It?

BLOG POST

Thermal Growth Compensation- Growth Versus Targets

BLOG POST

Should Thermal Growth Affect Angular Misalignment?

Activity 7-2

Entering Thermal Targets at the Feet

1. Student enters thermal targets at the feet.

Discussion 7-2

Entering Thermal Targets at the Feet

1. When would you enter the Thermal Growth Target Values at the feet?
2. Can Thermal Growth Targets be entered for both the moveable and stationary machines?
3. Where do your thermal growth targets come from?
4. Should thermal growth targets be used if the machine you are aligning is hot?

Module 7-3

Entering Thermal Targets at the Coupling

[Objective]

At the end of this module, the student will be able to:

- Enter thermal targets at the coupling for the movable machine.

Module 7-3

Entering Thermal Targets at the Coupling

[Lesson] The instructor will demonstrate the following:

- Select the Thermal Targets icon.
- Choose the coupling icon.
- Define and enter targets.
- Return to the shaft alignment.

Activity 7-3

Entering Thermal Targets at the Coupling

1. Students re-measure new alignment results, then input thermal offset targets at the coupling of +.5 mils per inch angularity, and an offset of +3 mils.

Discussion 7-3

Entering Thermal Targets at the Coupling

1. Where do I get these targets?
2. Why would you use foot targets vs. coupling targets?
3. How do I use the positive and negative values?
4. Can I store these targets?

Module 7-4

Practice #7: Using Thermal Targets

[Objective]

At the end of this module, the student will be able to:

- Perform the entire precision alignment process with a tolerance of 1800 RPM and to Thermal Targets of -8 mils for the front and rear feet of the movable machine.

Module 7-4

Practice #7: Using Thermal Targets

[Lesson] The instructor will observe & assist in the following:

- Remove the shims from the moveable element.
- Perform your pre-alignment checks and corrections.
- Enter Thermal Target Foot Values of -8.0 mils for the front and rear feet of the movable machine.
- Perform a precision alignment for an 1800 rpm machine.
- Re-measure and document the results.

Discussion 7-4

Practice #7: Using Thermal Targets

1. What icon should you see on the EVO screen when performing an alignment with Thermal Targets.
2. You have entered a Thermal Target of -8.0 mils for the front feet of the movable machine. The EVO Shim Screen shows to remove 28 mils from the front feet. How much shim do you remove?

Module 7-5

Vertical Alignment

[Objective]

- At the end of this module, the student will be able to:
- Identify when to use the vertical alignment application.
- Understand the differences in vertical alignment of C-face motors, and vertically-oriented motors with four feet.

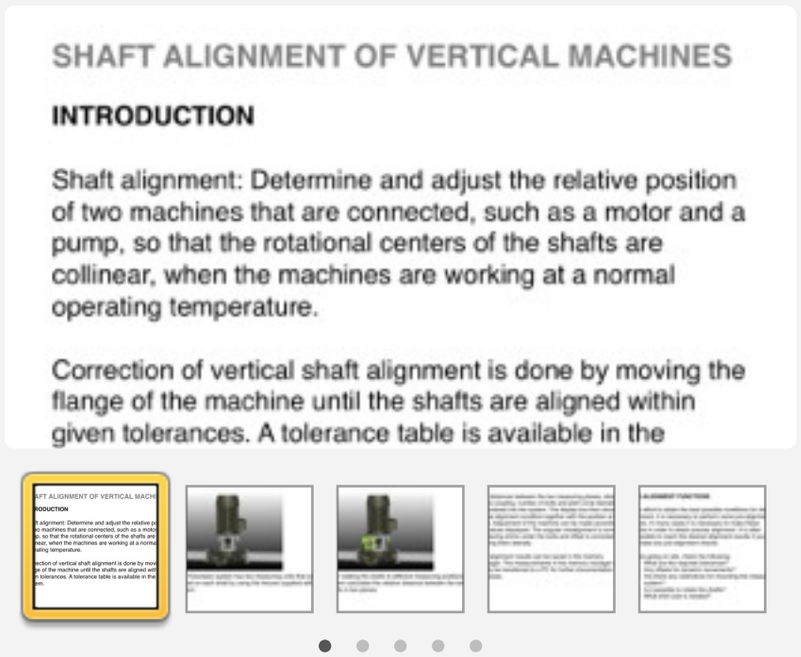
Module 7-5

Vertical Alignment

[Lesson] The instructor will demonstrate & discuss the following:

- The Vertical Alignment icon.
- Differences in C-face and four footed motors.

Lesson Gallery 7.5.1 Vertical Alignment



BLOG POST

A Vertical Shaft Alignment Process

Discussion 7-5

Vertical Alignment

1. What are the major differences in the dimensions needed to perform a vertical alignment?
2. How could you perform a vertical alignment on a machine with four motor feet?
3. If you have a horizontally-mounted C-face motor, which measurement method should you use – horizontal or vertical?

Module 7-6

Machine Defined Data

[Objective]

At the end of this module, the student will be able to:

- Understand the Machine Defined Data function of the EVO.
- Discuss possible uses of the function.

Module 7-6

Machine Defined Data

[Lesson] The instructor will demonstrate the following:

- How to save Machine Defined Data

Lesson Gallery 7.6.1 Machine Defined Data

MACHINE DEFINED DATA

INTRODUCTION

If the sensors are placed at the same place each time a machine (or more identical machines) is measured, it can be convenient to preload the relevant parameters. The data that can be preloaded are:

- The name of the specific machine,
- Distances for the machine, the distance between the sensors (where fixture points are fixed), the distance between the center of the coupling and the M-sensor,

Module 7-6

Machine Defined Data

[Lesson cont'd] The instructor will demonstrate the following:

- How to recall Machine Defined Data

Discussion 7-6

Machine Defined Data

1. You have 10 identical motor-pump configurations. Could a Machine Defined Data template be used?

2. If the 10 machines above were not identical, could a Machine Defined Data template be used? Why or why not?

Module 7-7

Advanced Shaft Alignment Resources

BLOG POST

Shaft Alignment Thermal Growth Targets- When You Don't Know

BLOG POST

Checking Your Thermal Targets

BLOG POST

How Does Calculating Your Own Alignment Targets Work?

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Thermal Growth Compensation- Growth Versus Targets

BLOG POST

Should Thermal Growth Affect Angular Misalignment?

BLOG POST

Calculating Foot Targets

BLOG POST

Measuring Thermal growth with XA Pro and OL2R

BLOG POST

Machine Train Shaft Alignment- To Move or Not to Move

BLOG POST

A Vertical Shaft Alignment Process

VIDEO

Dial Indicator Alignment Concepts

Fixturlaser EVO Training Manual

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