Intelligent Compaction

2012 ARIZONA PAVEMENTS/ MATERIALS CONFERENCE


FAT BOY ROLLER COMPANY
FB

INTELLIGENT COMPACTION

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INTELLIGENT COMPACTION MYTHS & METHODS

COMPONENTS OF INTELLIGENT COMPACTION

- OPERATIONAL SYSTEMS
- MAPPING SYSTEMS
- GPS

Intelligent Compaction?

WHAT IS

INTELLIGENT COMPACTION

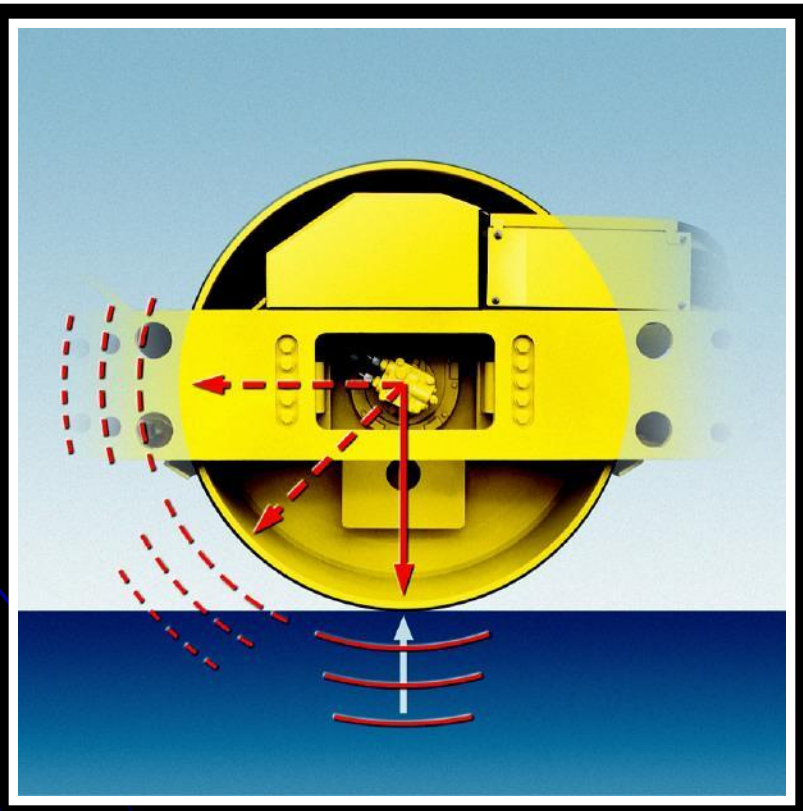
INTELLIGENT COMPACTION IS:

- A SYSTEM THAT MEASURES THE STIFFNESS OF THE MATERIAL BEING COMPACTED
- A MEASUREMENT OF THAT STIFFNESS AS RELATED TO DENSITY
- A SYSTEM THAT MAKES OPERATIONAL CHANGES ON THE ROLLER EXCLUSIVE OF THE OPERATOR

INTELLIGENT COMPACTION IS:

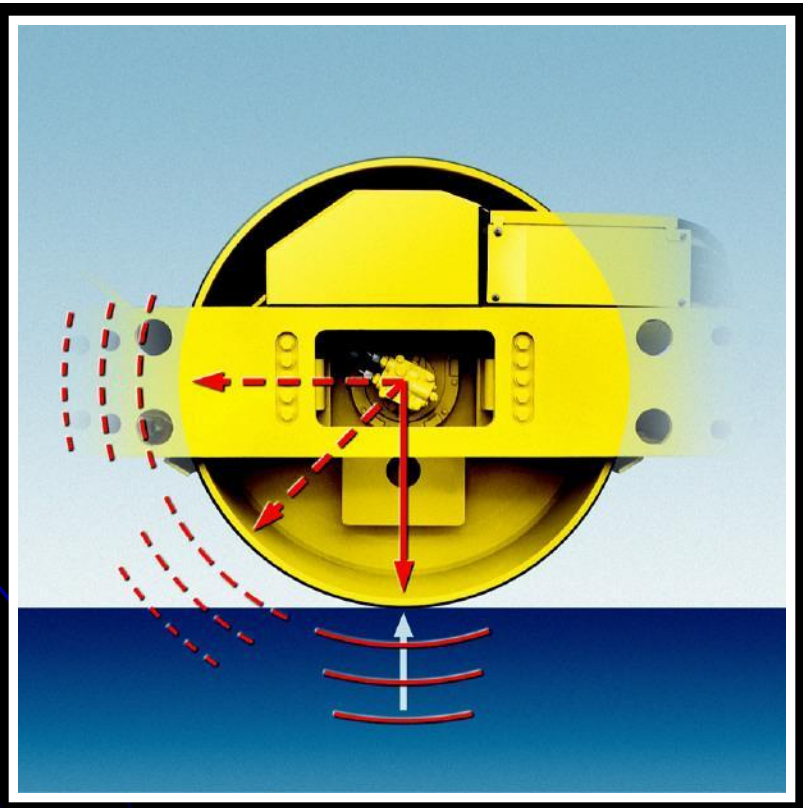
- A SYSTEM THAT DOCUMENTS THE STIFFNESS OF THE MATERIAL, THE LOCATION, AND THE # OF PASSES.
- A QUALITY CONTROL SYSTEM THAT IMPROVES DENSITY AND SMOOTHNESS OF THE MATERIAL BEING COMPACTED; AND IS A PROF ROLLER.

What is “intelligence”



What is “intelligence”

“… the ability to adapt its behavior in response to varying situations and requirements”

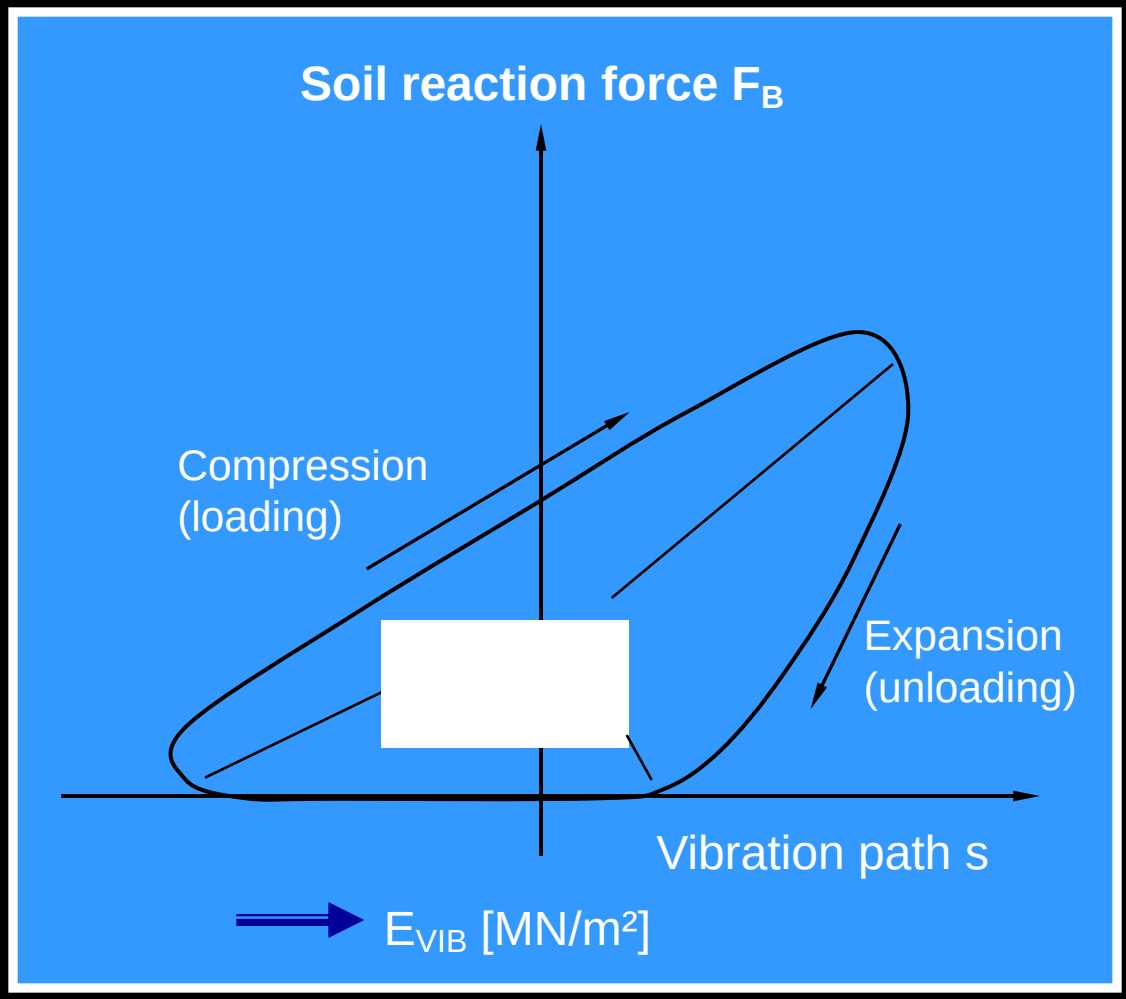


INTELLIGENT COMPACION IS NOT:

- A SYSTEM THAT MEASURES DENSITY ON THE ROLLER.
- AS SYSTEM THAT MEASURES THE RELATIONSHIP BETWEEN DENSITY ON THE MATERIAL AND STIFFNESS ON THE ROLLER; IF YOU DO NOT HAVE A BASE WITH CONFINEMENT.
- A SYSTEM THAT CAN BE USED ON PNEUMATIC OR STEEL STATIC ROLLERS

Intelligent Soil Compaction

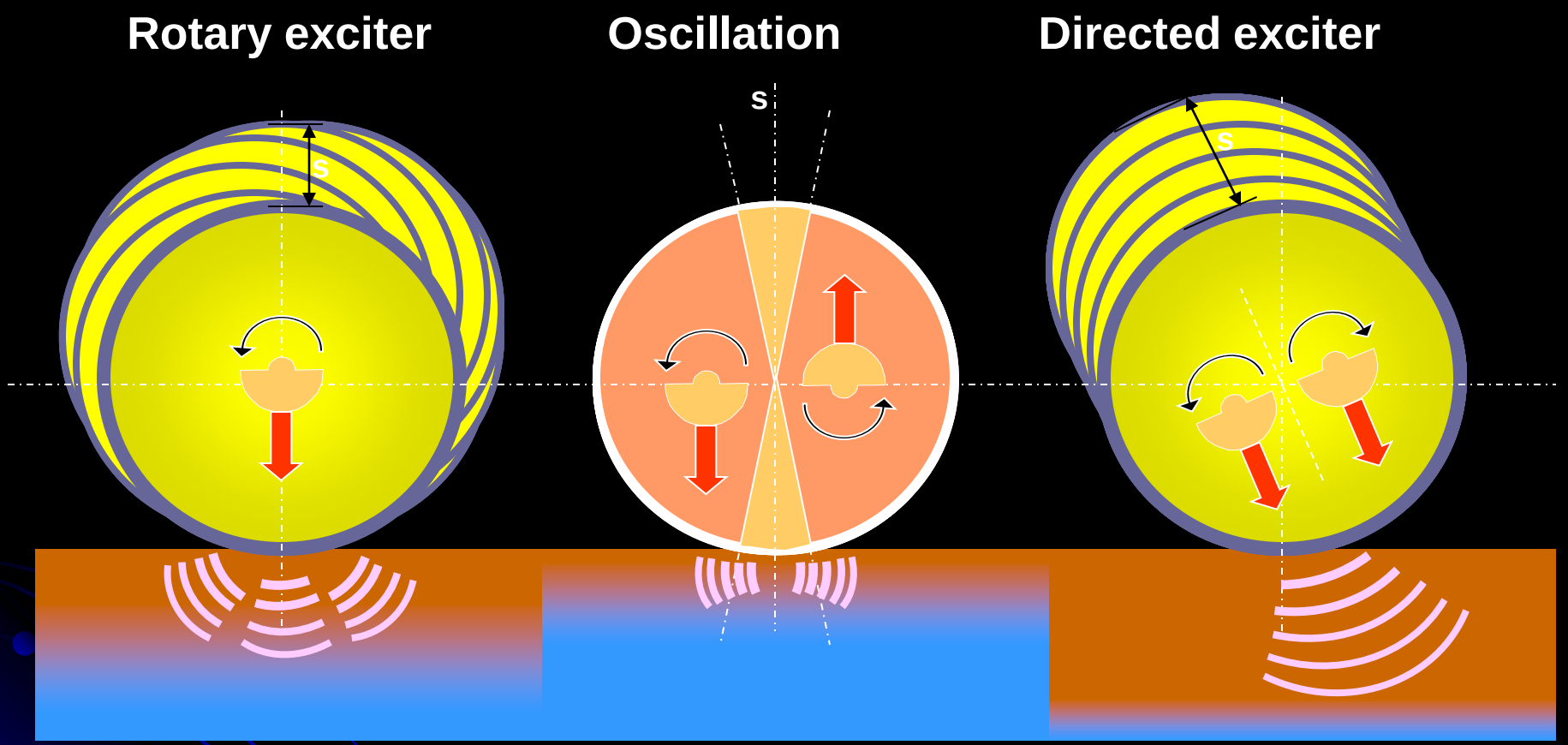
EVIB



3 TYPES OF VIBRATORY SYSTEMS

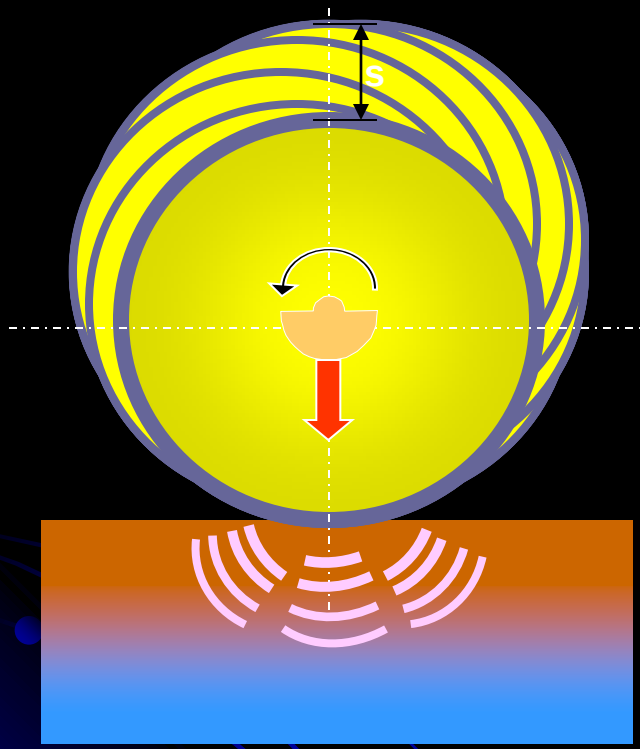
- ROTARY- STANDARD SYSTEM ON MOST VIBRATORY ROLLERS
- OSCILLATION- MOVEMENT OF DRUM IS OSCILLATING
- DIRECTED- MAXIMUM FORCE IN VERTICAL MOVEMENT OF DRUM

Exciter Method Variation

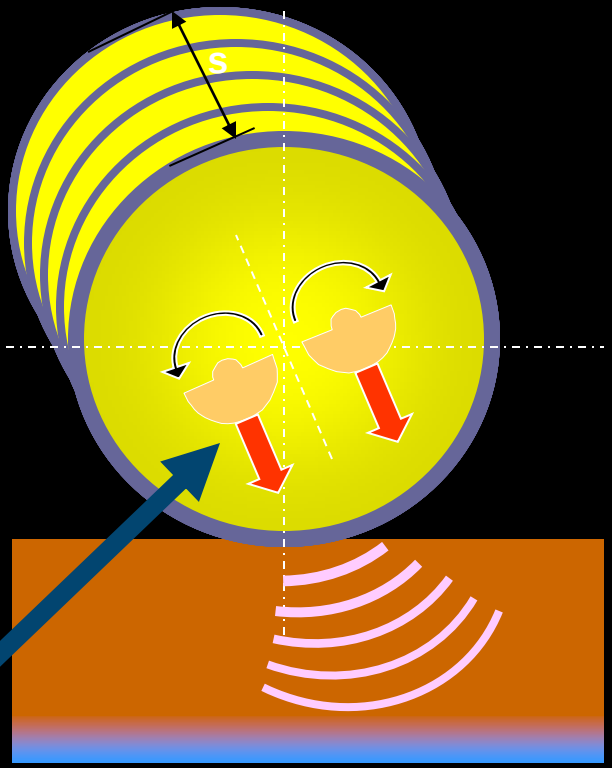


Exciter Method Variation

Rotary exciter



Directed exciter



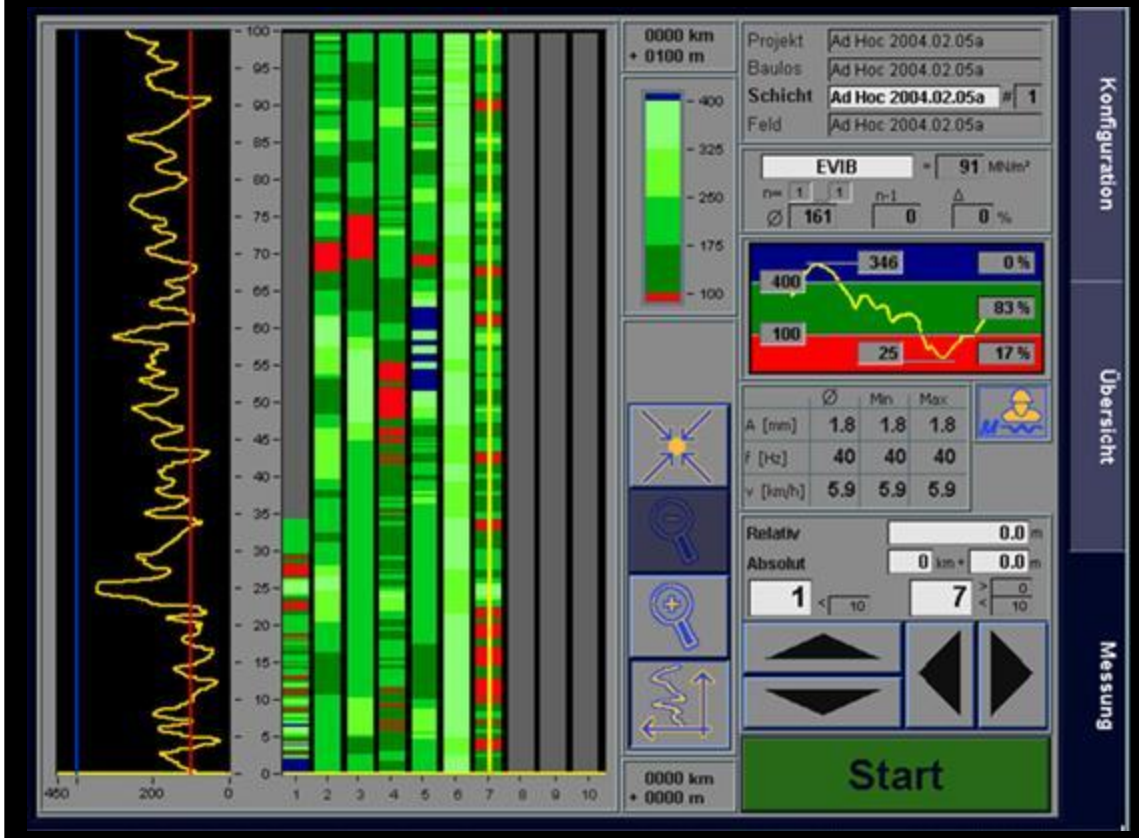
True Intelligent Compaction

The Traditional Way of Compa

- High or Low Amplitude Choices
- Pre-defined number of passes –
- or Experience

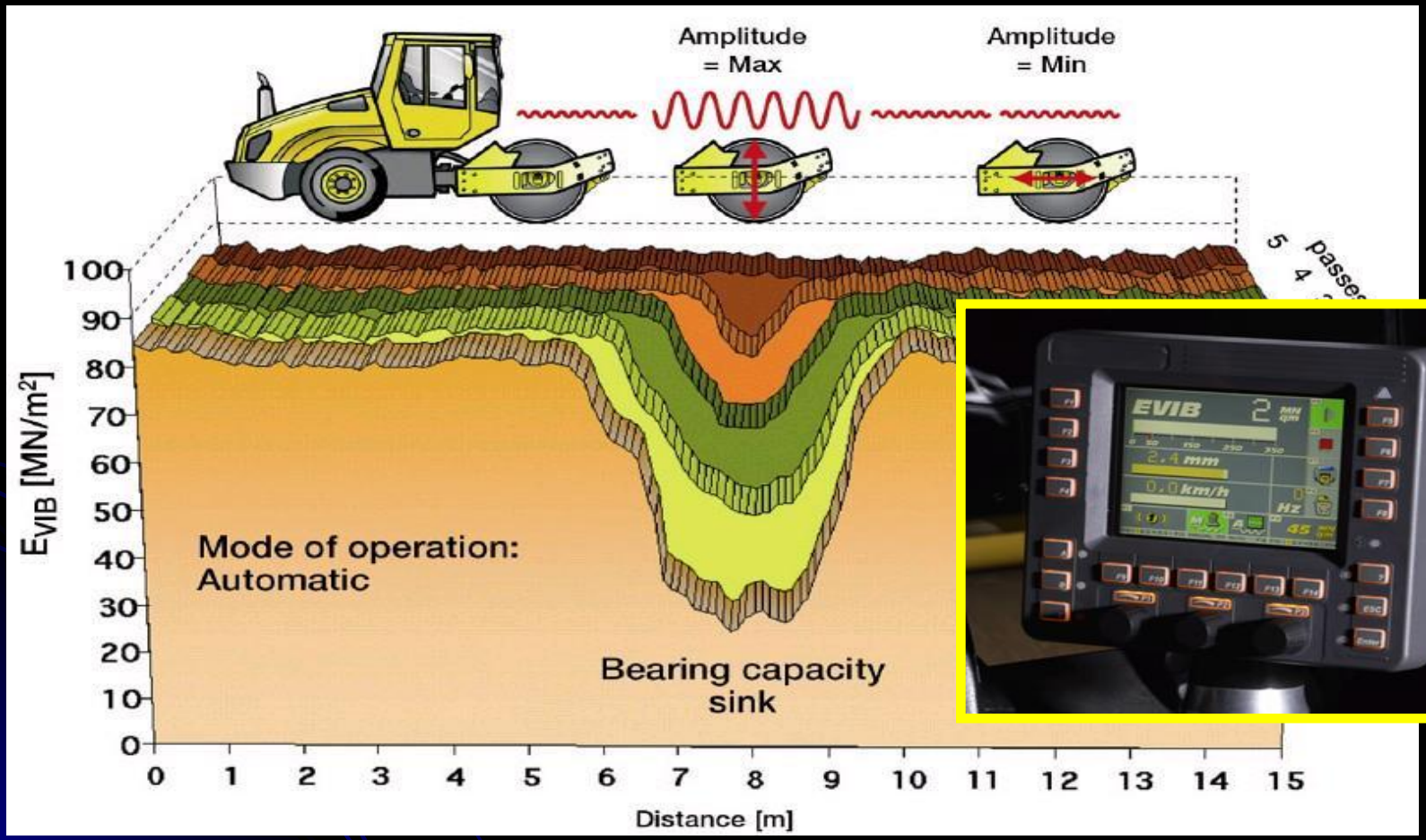
- Potentially Low Efficiency
- Potentially Low Effectiveness
- Contractor loses

Electronic Documentation



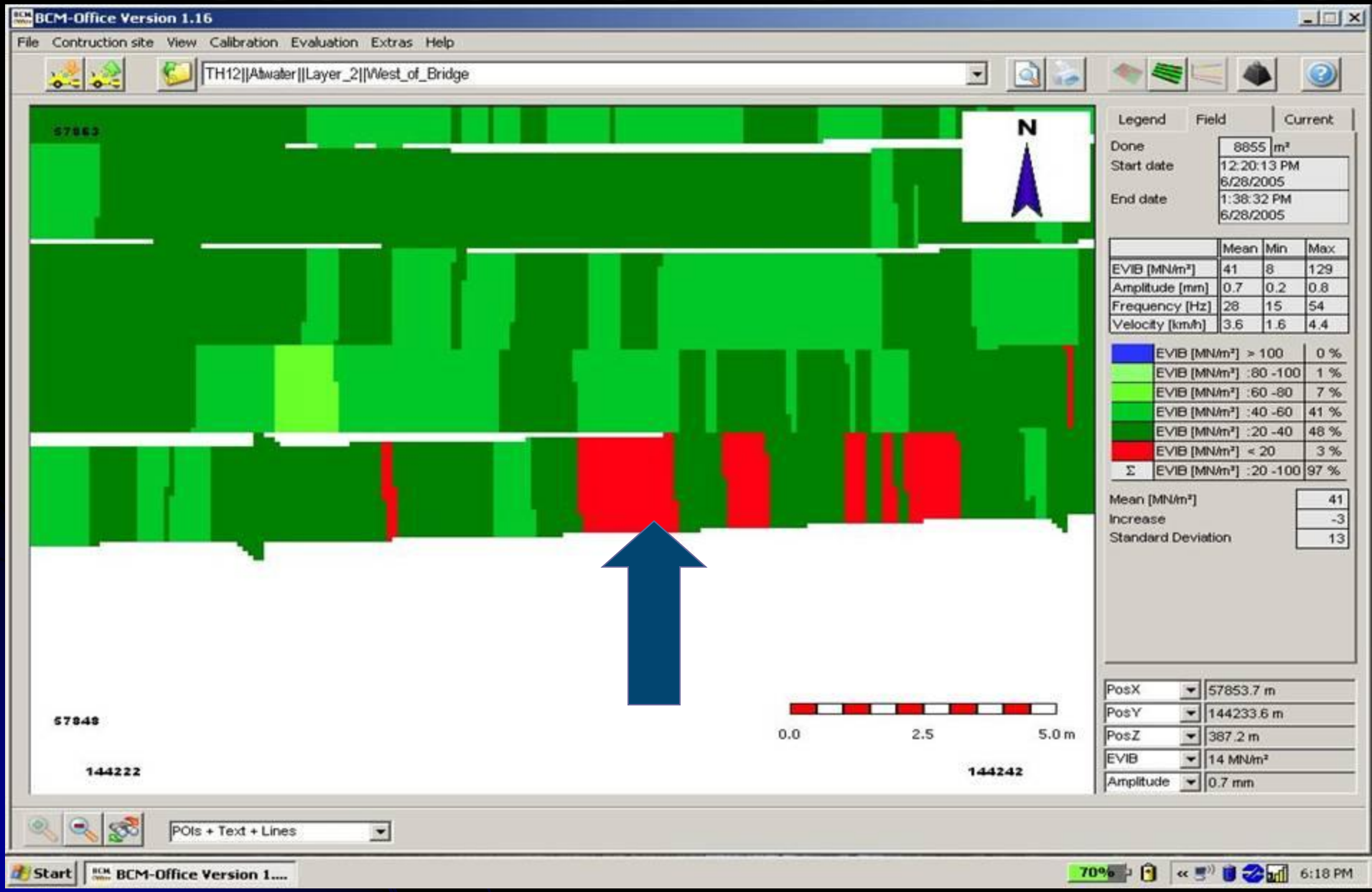
BCM05 Display

IC BVC Performance



Minnesota Highway Site 2007

Documented Low Stiffness



Documented Low Stiffness A

vill have repeat failure without drainag

Compaction Bonuses

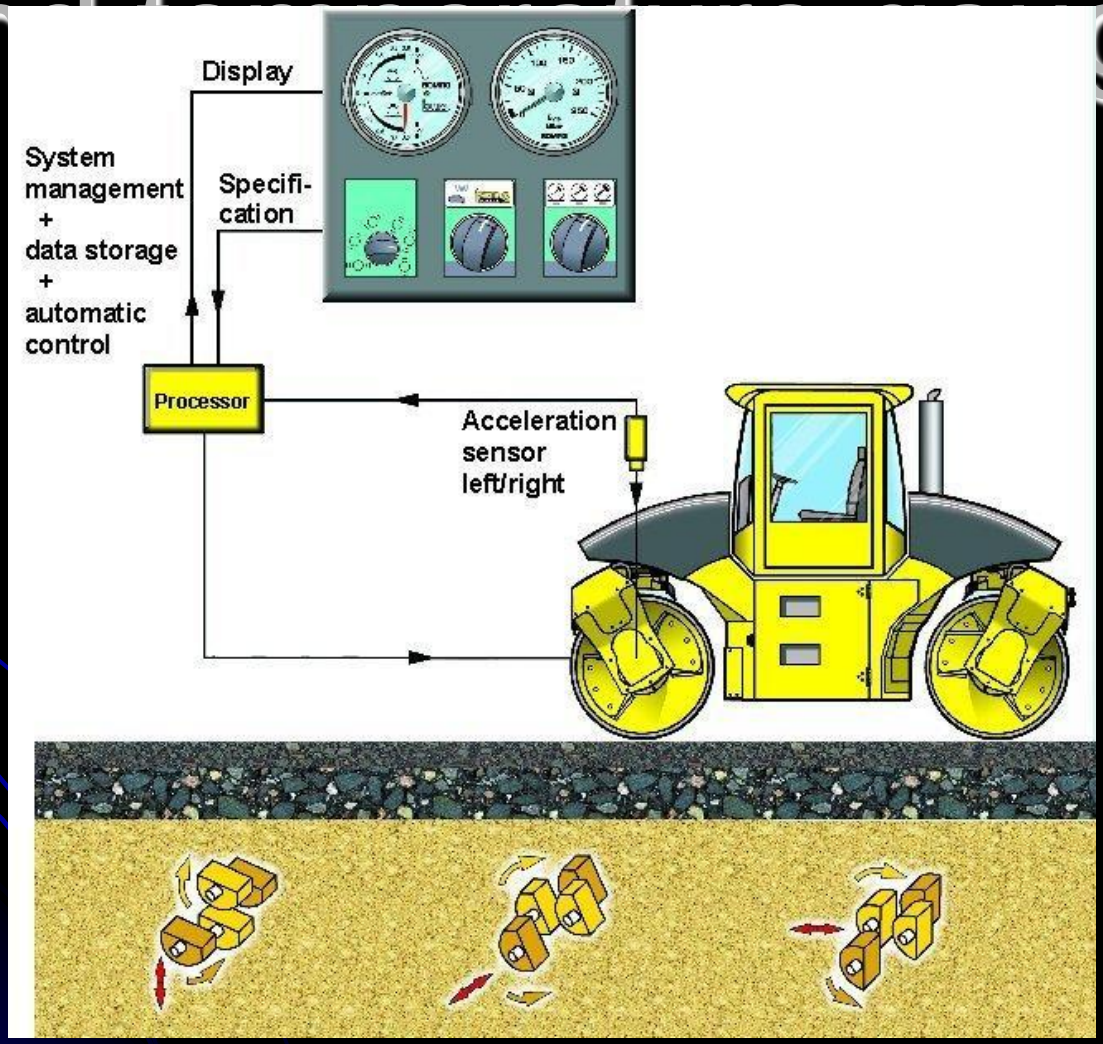
Locate Non-Compactable Areas

Operation Improvement

Complete Surface Documentation

IC for Asphalt

Asphalt Manager with new measuring value E_{VIB} [MN/m²] and temperature gage



Asphalt Manager Versatility

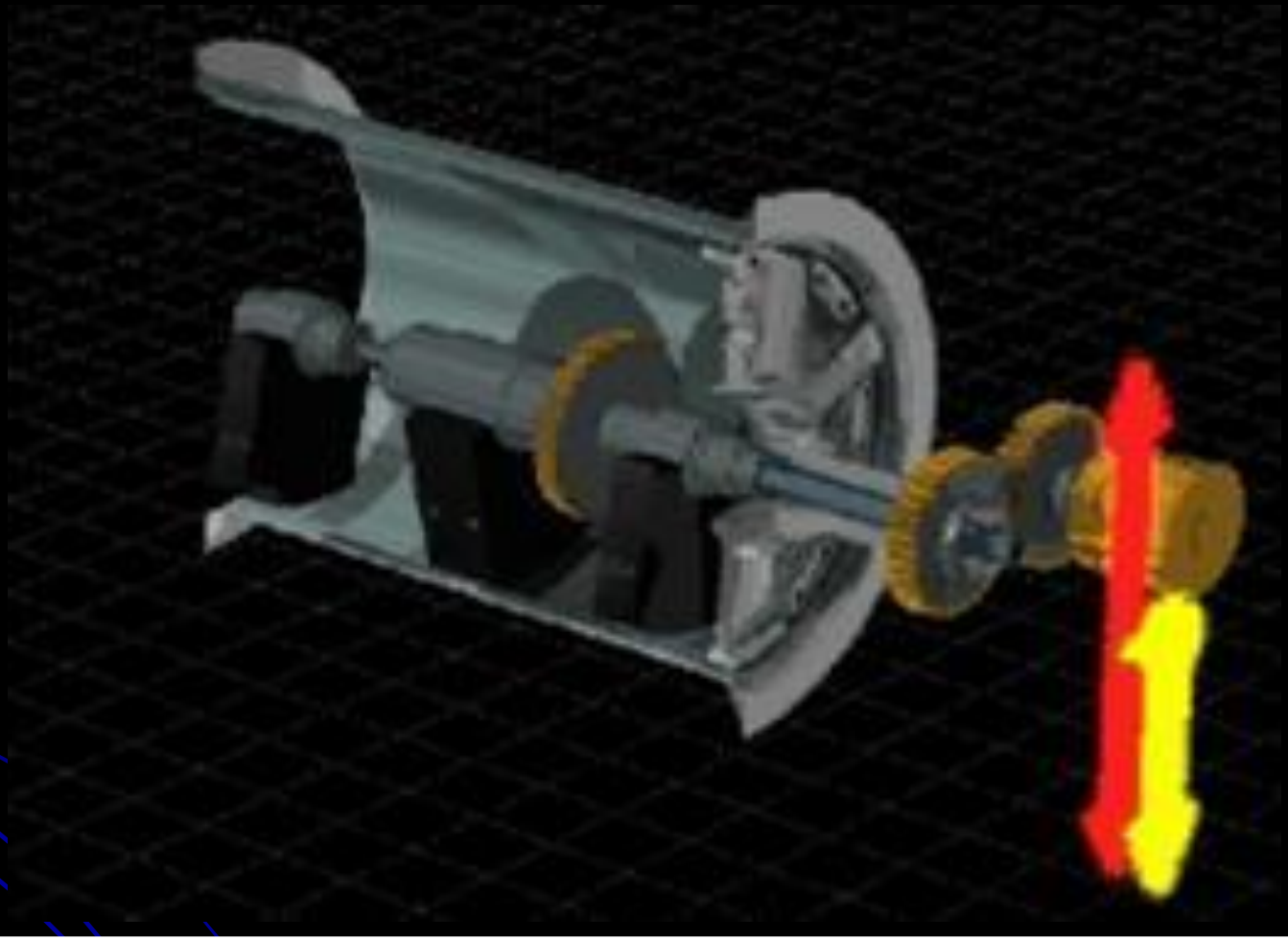
Horizontal Vector

 # 4 Mid Vector

 # 6 Vertical Vector

ASPHALT MANAGER
E VIB

Vario Directed Exciter



From Horizontal to Vertical

6 Force Outputs Created by Vectoring

Bomag Operational Panel

PRINTER
- **Start**
- **Stop**
- **Print out**
- **Delete**

Test procedere:

- **Mark the track to be compacted**
- **„Manual operation mode“ with**
- **Fixed amplitude**
- **Fixed working speed**

BOP Screen

EVIB

TEMP

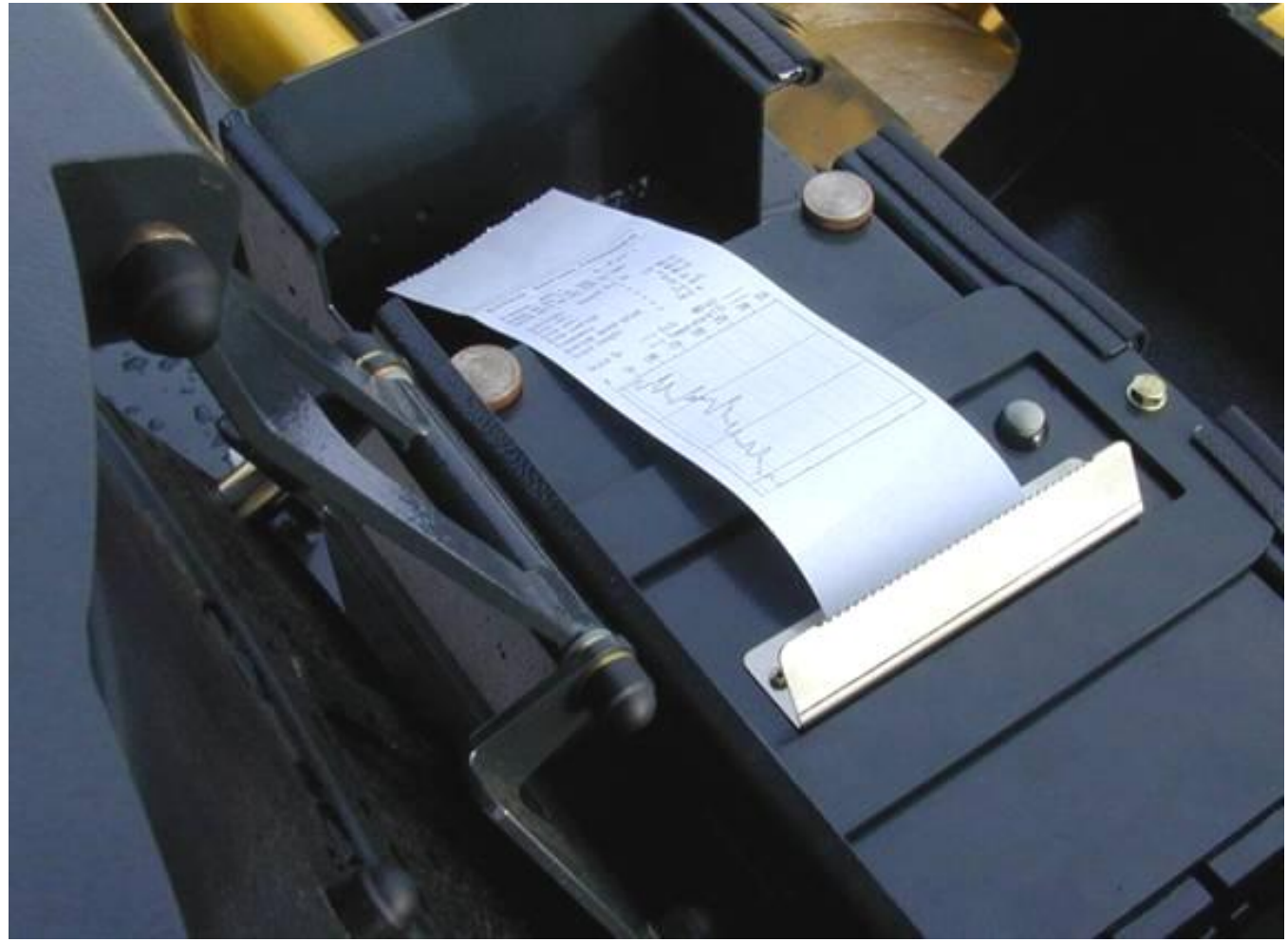

EVIB
PSI x100
0 100 200 300 400 500
0.0 in/100
0.0 mph
vpm
145 PSI x100
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
P1
P2
P3
A
B
C
?
ESC
Enter
MANUAL
AUTO
Metric to U.S Units

Changing From Metric To U.S. Units


Manual Settings
EVIB
PSI x100
0 100 200 300 400 500
0.0 in/100
0.0 mph
vpm
145 PSI x100
F1
F2
F3
F5
F6
F7
F8
A
B
C
F9
F10
F11
F12
F13
F14
P1
P2
P3
?
ESC
Enter

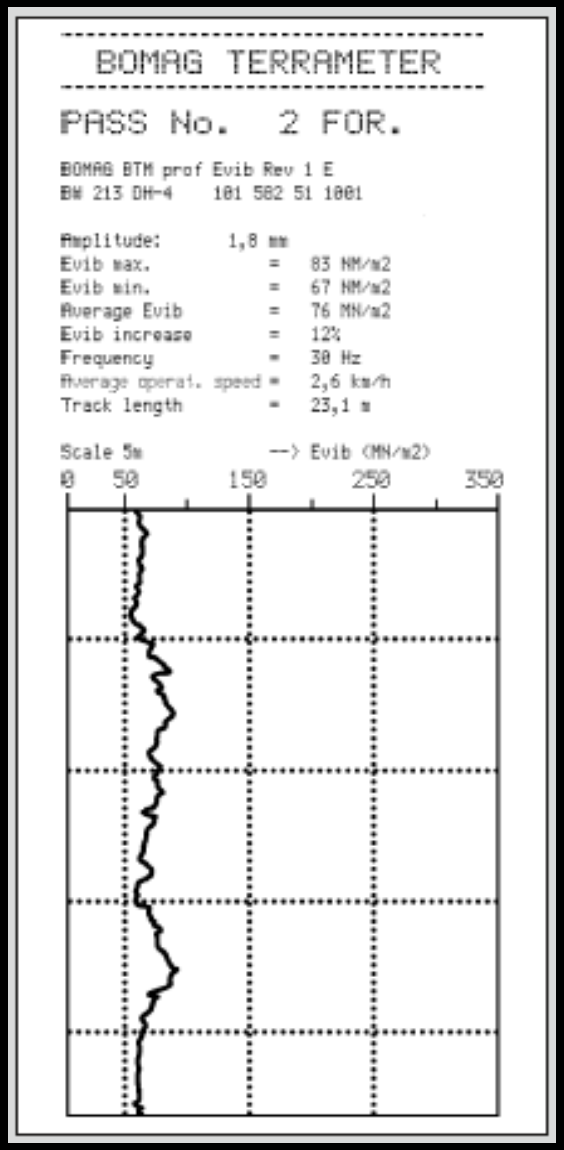
6 Settings From Horizontal To Vertical

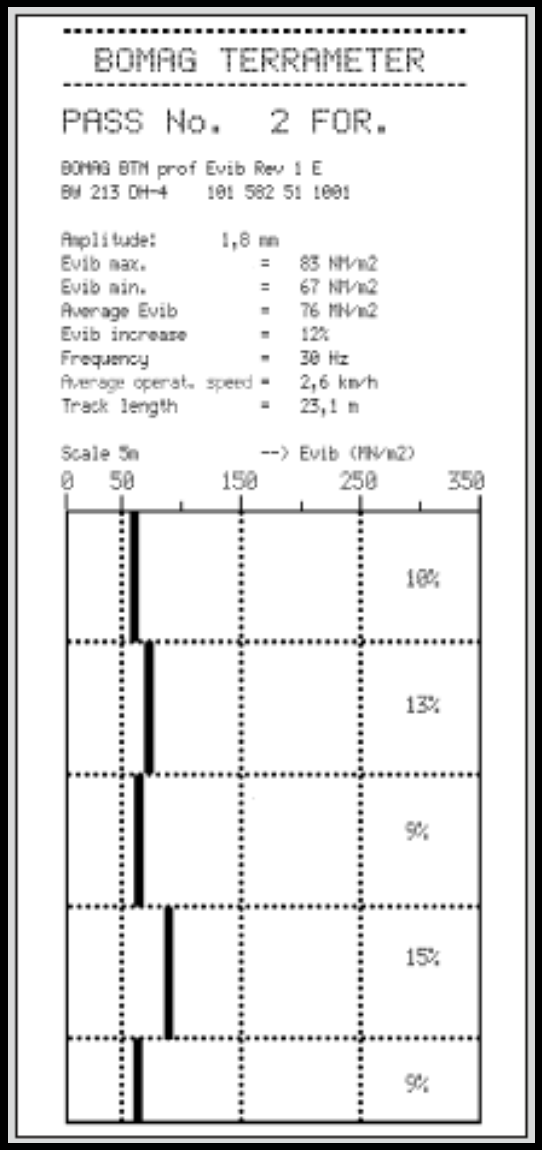
On Board Printer



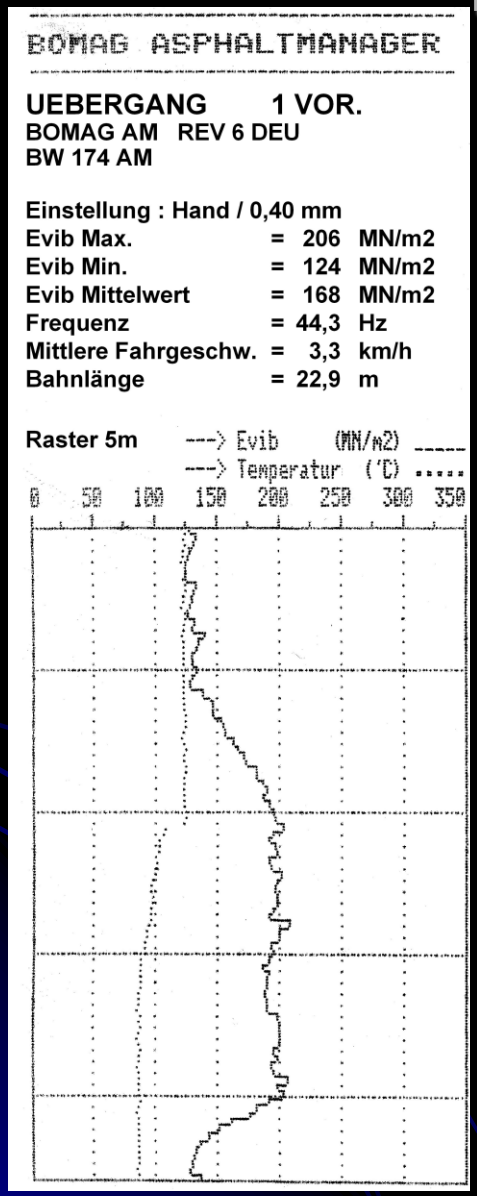
Basic Printed Documentation

- Number of Passes
- Temperature
- Evibe Min and Max
- Evibe Average
- Frequency
- Average Speed
- Track Length





E_{VIB} - Printer



BOMAG ASPHALTMANAGER

UEBERGANG 1 VOR.
BOMAG AM REV 6 DEU
BW 174 AM

Einstellung : Hand / 0,40 mm

Evib Max.	=	206	MN/m2
Evib Min.	=	124	MN/m2
Evib Mittelwert	=	168	MN/m2
Frequenz	=	44,3	Hz
Mittlere Fahrgeschw.	=	3,3	km/h
Bahnlänge	=	22,9	m

Raster 5m ---> Evib (MN/m2) _____
---> Temperatur (°C) .....

0 50 100 150 200 250 300 350

E_{VIB} Max. / E_{VIB} Min.

E_{VIB} Average

Frequency

Average Speed

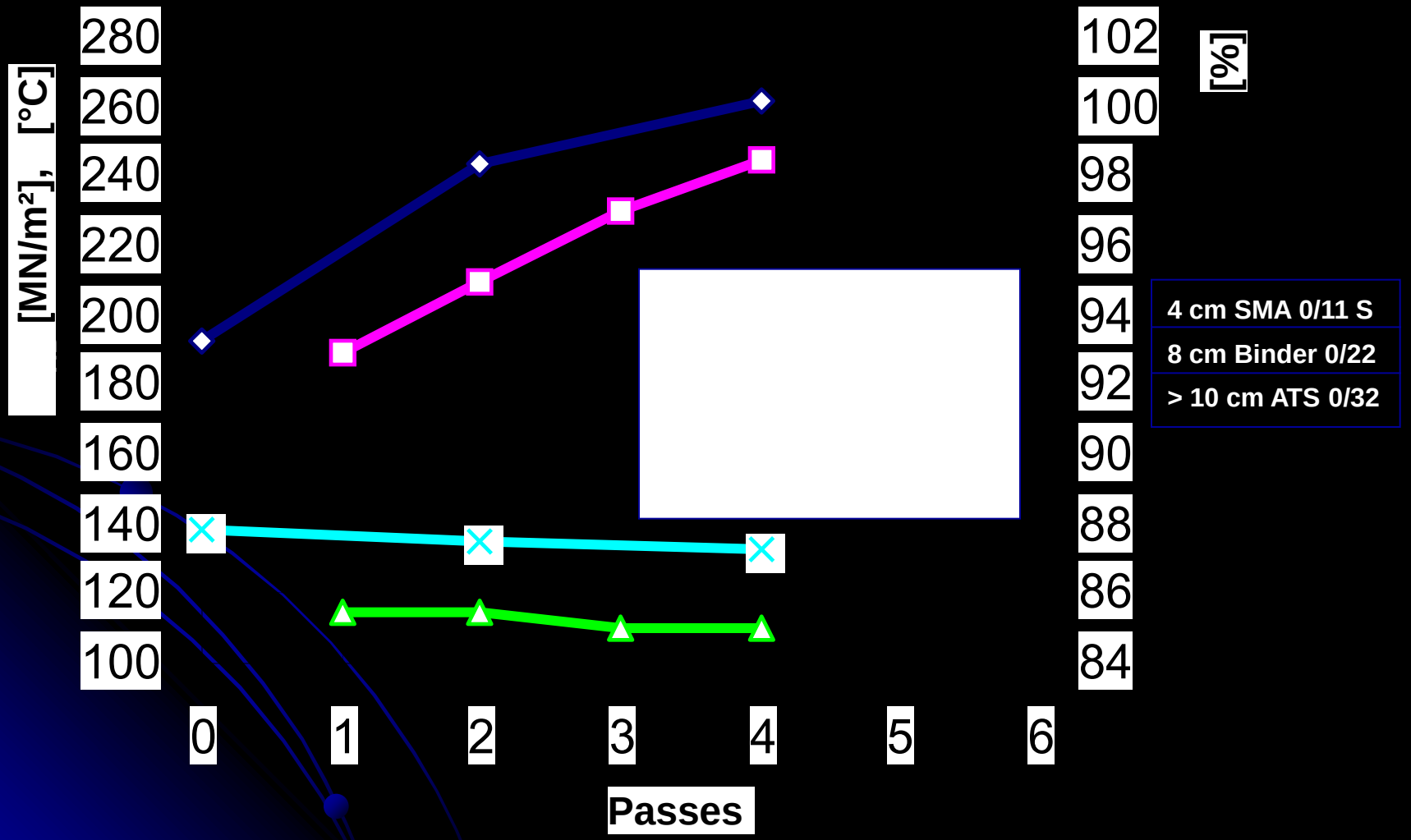
Track length

Temperature

8.8.2 Test Strip Construction

- Simulating Actual Conditions
- Establishing Roller Pattern
- Effective Roller Speed

E_{VIB} and Density as function of passes; BW 174 AD Asphalt Manager, Automatic mode; Asphalt Base 0/32 CS B65, Nürnberg A3

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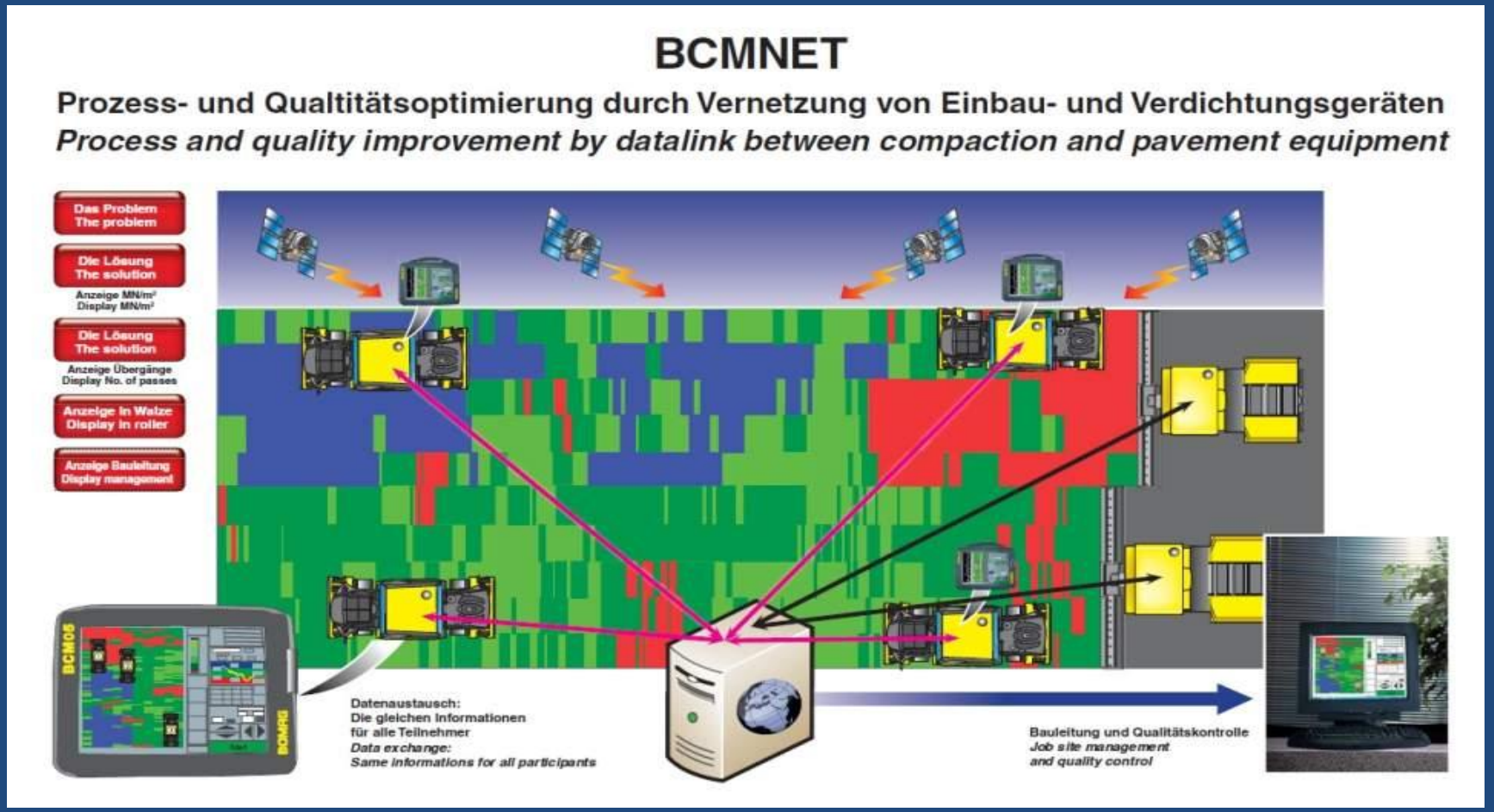
Outlook: DATA-LINK



A PROOF ROLLER

2 PASSES VERSUS 3 IN TEST STRIP

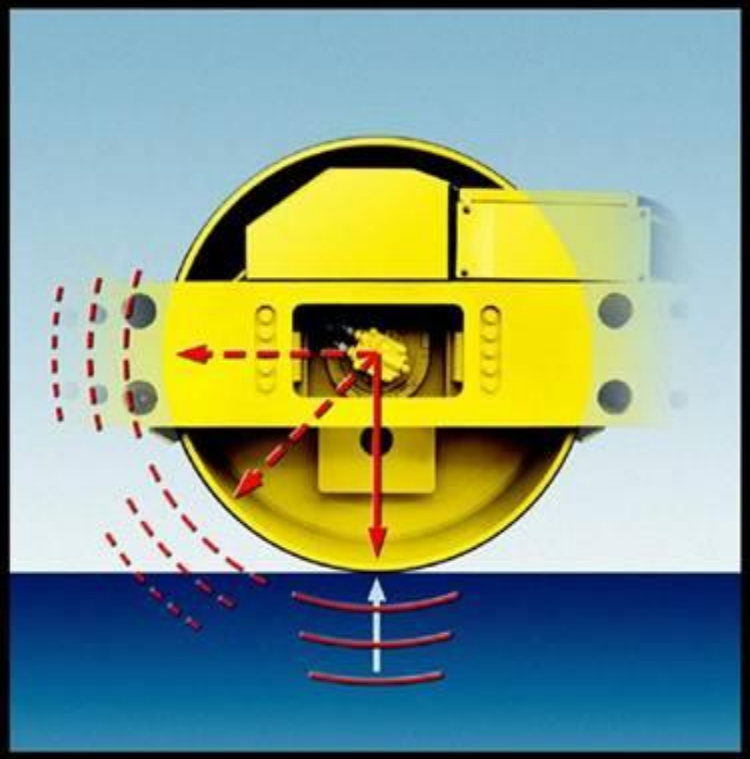

BOMAG

ULTIMATE SMOOTHNESS

- ONE DRUM VIBRATING IN HORIZONTAL VIBRATION DIRECTION---FRONT DRUM
- REAR DRUM SHUT OFF
- 13/4INCH LOOSE LIFT 2PASSES-DENSITY 93.7% MTD
- SMOOTHNESS 38.5-42.0 IRI MEASURED WITH A LAZER MOUNTED VEHICLE


BOMAG

IC Vario Benefits – Why IC ???



$ VALUE

- I/C MEASURES THE STIFFNESS OF A LIFT OF HMA
- DENSOMETERS MEASURE DENSITY OF HMA
- THIS GIVES US TWO MEASUREMENTS OF THE STABILITY OF THE HMA
- WHY CUT SO MANY CORES THAT COST $800.00-$1000.00 A CORE

THANK YOU