


The IDEAL Plus By TestQuip



Clinton Van Winkle - Troxler Electronic Laborites
Rocky Mountain Asphalt Conference and Equipment Show



1

IDEAL Plus

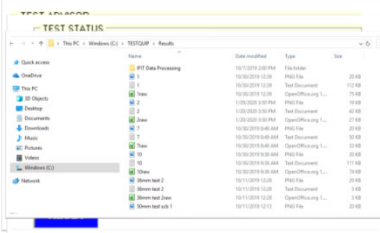
- User Friendly Computer Interface
- Able to Perform Multiple Tests
- Patented Load Line Displacement (LLD) Measurement System
- Servo-Hydraulic Driven


2

User Friendly Interface

- Test Advisor displays Concise instruction
- Test Results Quickly and Accurately
- Automatically saves results





Name	Date Modified	Type	Size
Test Data Processing	10/10/2019 12:00:00	Test Result	20.00
Test 1	10/10/2019 12:00:00	Test Document	10.00
Test 2	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 3	10/10/2019 12:00:00	Test Document	10.00
Test 4	10/10/2019 12:00:00	Test Document	10.00
Test 5	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 6	10/10/2019 12:00:00	Test Document	10.00
Test 7	10/10/2019 12:00:00	Test Document	10.00
Test 8	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 9	10/10/2019 12:00:00	Test Document	10.00
Test 10	10/10/2019 12:00:00	Test Document	10.00
Test 11	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 12	10/10/2019 12:00:00	Test Document	10.00
Test 13	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 14	10/10/2019 12:00:00	Test Document	10.00
Test 15	10/10/2019 12:00:00	Test Document	10.00
Test 16	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 17	10/10/2019 12:00:00	Test Document	10.00
Test 18	10/10/2019 12:00:00	Test Document	10.00
Test 19	10/10/2019 12:00:00	OpenOffice.org...	10.00
Test 20	10/10/2019 12:00:00	Test Document	10.00



3

Multiple Tests


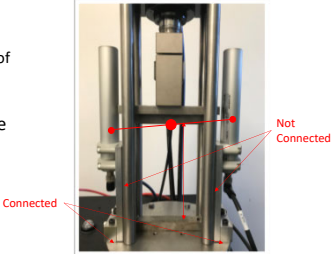
- Lottman Head
 - IDEAL-CT
 - Tensile Strength Ratio (TSR)
- SCB Fixture
 - I-FIT
 - Louisiana Method



4

Patented LLD Measurement System



- Average of two Balluff LVDTs
 - Measures displacement at point of loading
 - Precise to 0.001 mm
- Design Negates Flexure in Frame
 - LVDT are attached to base not frame
 - Frame can flex and not effect reference plane
 - Feedback Loop ensures precise rate



5

Servo-Hydraulics


- Instantaneous (0.2 s) Velocity
- Responsive Controls
- Capable of 6.5 tons of Force
- Same technology as Troxler 5850v2 Superpave Gyrotory Compactor




6


Product Comparison

Hydraulic Driven IDEAL Plus



Screw Driven Load Frame






7

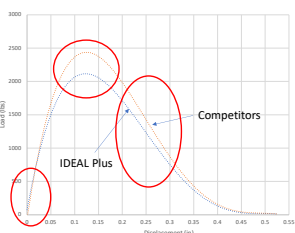
Product Comparison


<p>Hydraulic Driven IDEAL Plus</p> <ul style="list-style-type: none"> • Loading <ul style="list-style-type: none"> • Fast Response Time • No Friction • Flexing Negated • Feedback Loop autocorrects • Measurement <ul style="list-style-type: none"> • Measures at point of loading • Accounts for flexing in frame 	<p>Screw Driven Load Frame</p> <ul style="list-style-type: none"> • Loading <ul style="list-style-type: none"> • Slow Response Time • Internal Friction • Threads of Screw and Frame Flexing (storing energy to be released upon sample fracture) • No Feedback Loop • Measurement <ul style="list-style-type: none"> • Measurement offset from load • Includes flexing in frame
---	---



8

Product Comparison

<ul style="list-style-type: none"> • Initial Testing <ul style="list-style-type: none"> • IDEAL Plus: Instantaneous Velocity • Competitors: slow to initial velocity causing lower force • Pre-Fracture <ul style="list-style-type: none"> • IDEAL Plus: All energy is exerted on the sample • Competitors: Frame and thread of screws flex absorbing energy requiring excessive force to fracture • Post-Fracture <ul style="list-style-type: none"> • IDEAL Plus: Feedback Loop ensures proper rate • Competitors: Energy stored in frame and threads is released increasing the rate and shortening the test and increasing the slope 	
---	---



9

IDEAL-CT Index Calculation

$$CT_{Index} = \frac{l_{75}}{62} \times \frac{l_{75}}{D} \times \frac{G_f}{|m_{75}|} \times 10^6$$

IDEAL-CT Index Factors
 l_{75} : displacement at 75% of peak load
 G_f : Fracture Energy
 m_{75} : slope at 75% of peak load

Index Factors Effects

Factor	CT_{Index}
$l_{75} \uparrow$	\uparrow
$G_f \uparrow$	\uparrow
$m_{75} \uparrow$	\downarrow

ASTM 2017

10

Product Comparison

	IDEAL Plus		Competitors	
Factor	CT_{Index}	Factor	CT_{Index}	
l_{75}	\leftrightarrow	l_{75}	\uparrow	
G_f	\leftrightarrow	G_f	\uparrow	
m_{75}	\leftrightarrow	m_{75}	\downarrow	

- Although studies completed by TTI and NCAT have shown no statistical difference between CT Indices, but there are trends.
- In this example the variables used to calculate the CT Index.
 - l_{75} is larger in the screw driven machine.
 - G_f is larger in screw driven machine.
 - m_{75} is larger in screw driven machine.
- The errors would be significant if they influenced the test in the same direction
- The IDEAL Plus is the more accurate and repeatable machine despite the statistical analysis
- More research is being conducted on these products. NCAT, Florida, Ohio, and others.

Taylor and Moore, NCAT, 2019
Zhou, TTI, 2019

11

Conclusions

- The IDEAL Plus is extremely user-friendly.
- The IDEAL Plus is a superior design to screw driven load frames.
- The IDEAL Plus is more accurate in determining the variables used to calculate the CT Index.

12
