Innovative approach to production monitoring and process control
Alia Instruments non-nuclear abrasive slurry density meter

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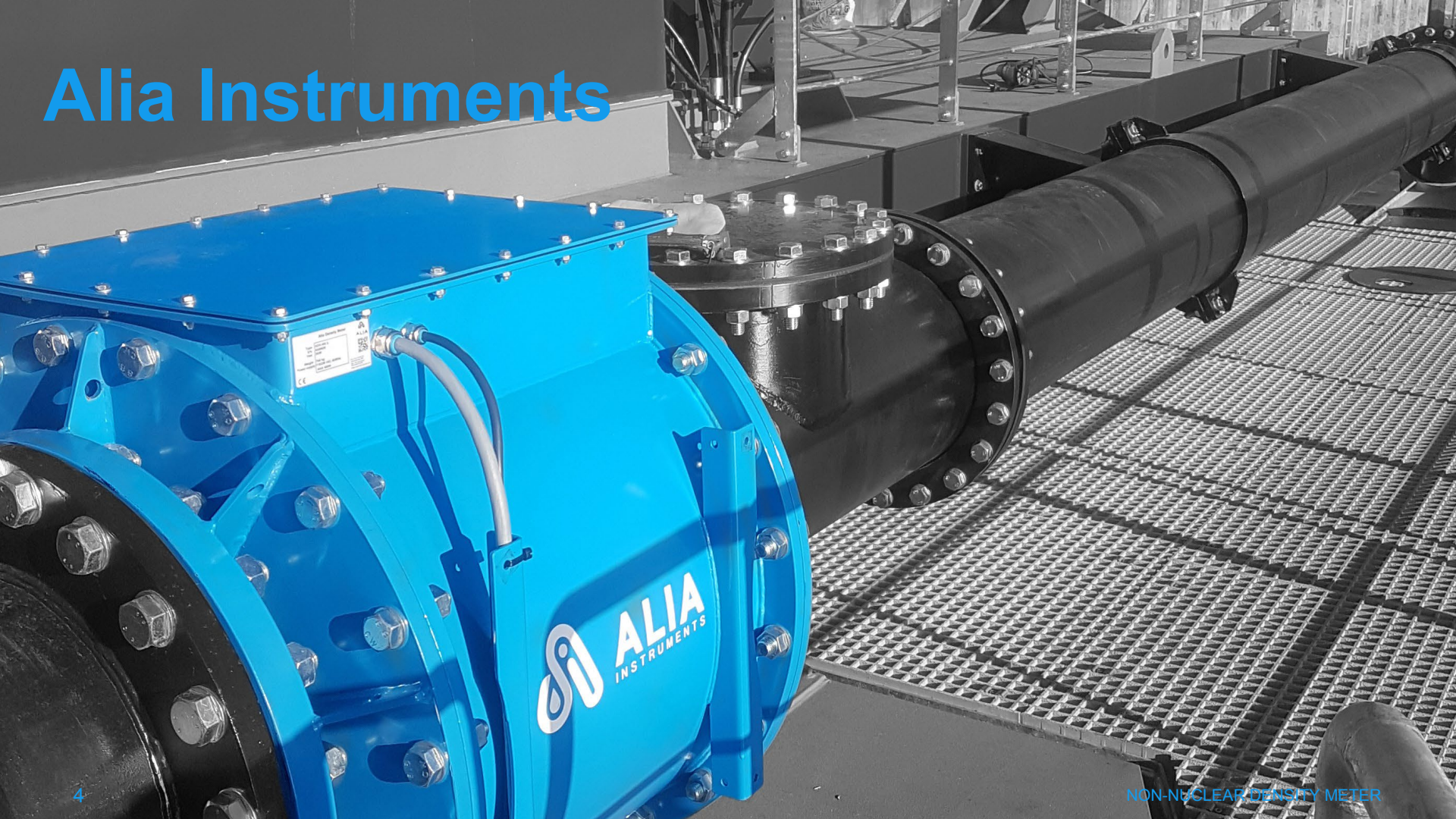
Alia Instruments



Background Alia Instruments

- Alia Instruments is a manufacturer of non-nuclear density monitoring equipment
- Our shareholder is Demcon Advanced Mechatronics. A group with over 1000 engineers.
- The initiative to develop a non-nuclear density meter for dredging was based on practical experience within the dredging industry

ADM working principle

Simple model: Newton's 2nd law

- Newton's 1st law is law of inertia; Newton's third law is action is reaction.

- Newton's 2nd law tells us that the force (∑ F) is equal to the mass (m) times the acceleration (a)

$$\sum \mathbf{F} = \mathbf{m} \times \mathbf{a}$$

- This law is used by ADM to **calculate** the mass (**m**) by measuring the force (F) and the acceleration (**a**)

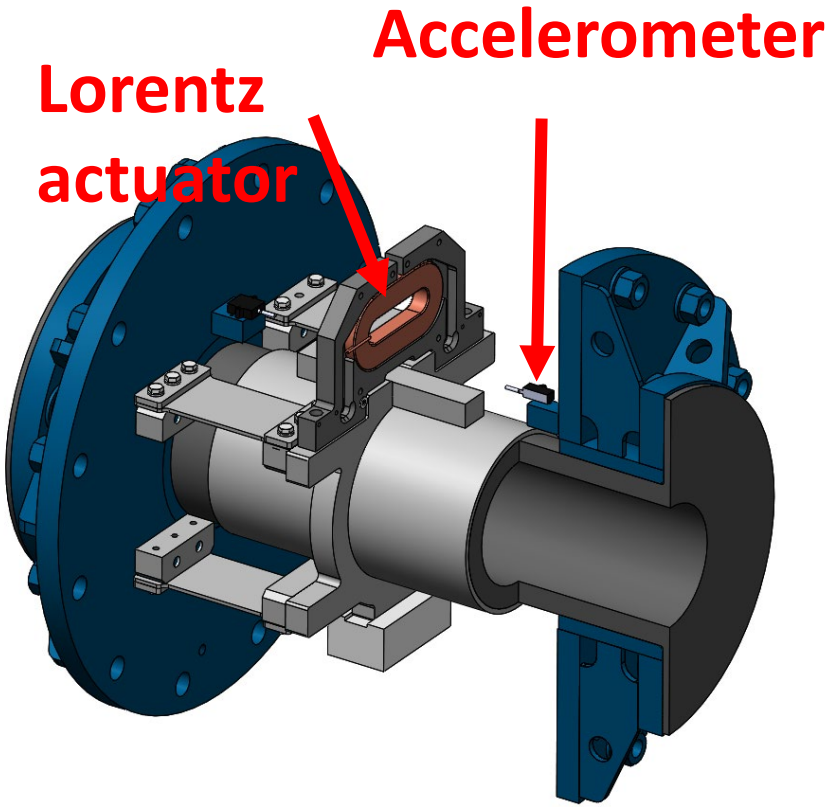
- Convert mass to density by division with the effective volume

$$\rho = \frac{m}{V}$$

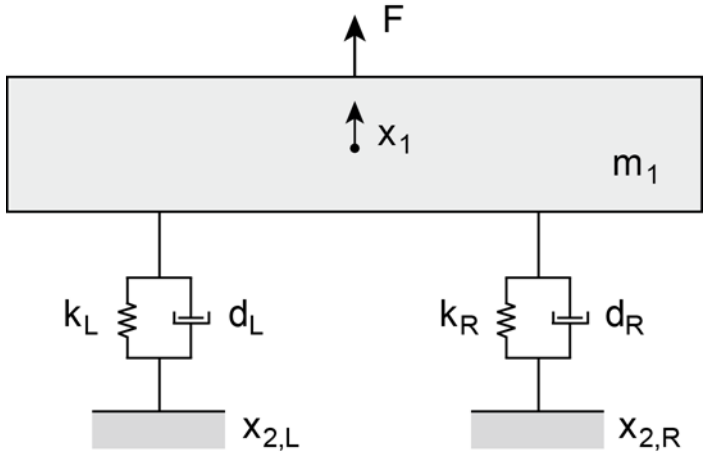
In 1687 Isaac Newton published in "Philosophiae Naturalis Principa Mathematica" the three laws of motion that form the basics for physics

Simple and robust design

- Lorentz actuator used to excite measurement tube in various frequency ranges
- Measure dynamic response using accelerometers



Realistic model: Newton's 2nd law



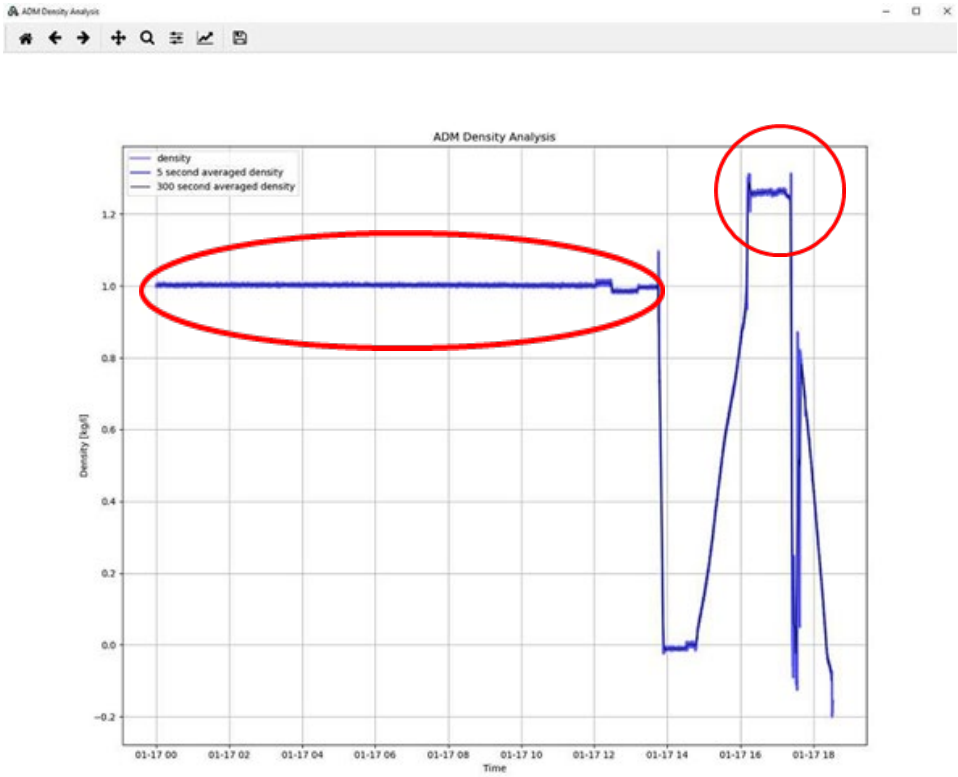
The realistic equation of motion for this configuration is now:

$$m_1 x''_1 = F - k_L(x_1 - x_{2,L}) - k_R(x_1 - x_{2,R}) - d_L(x'_1 - x'_{2,L}) - d_R(x'_1 - x'_{2,R})$$

Factory calibration

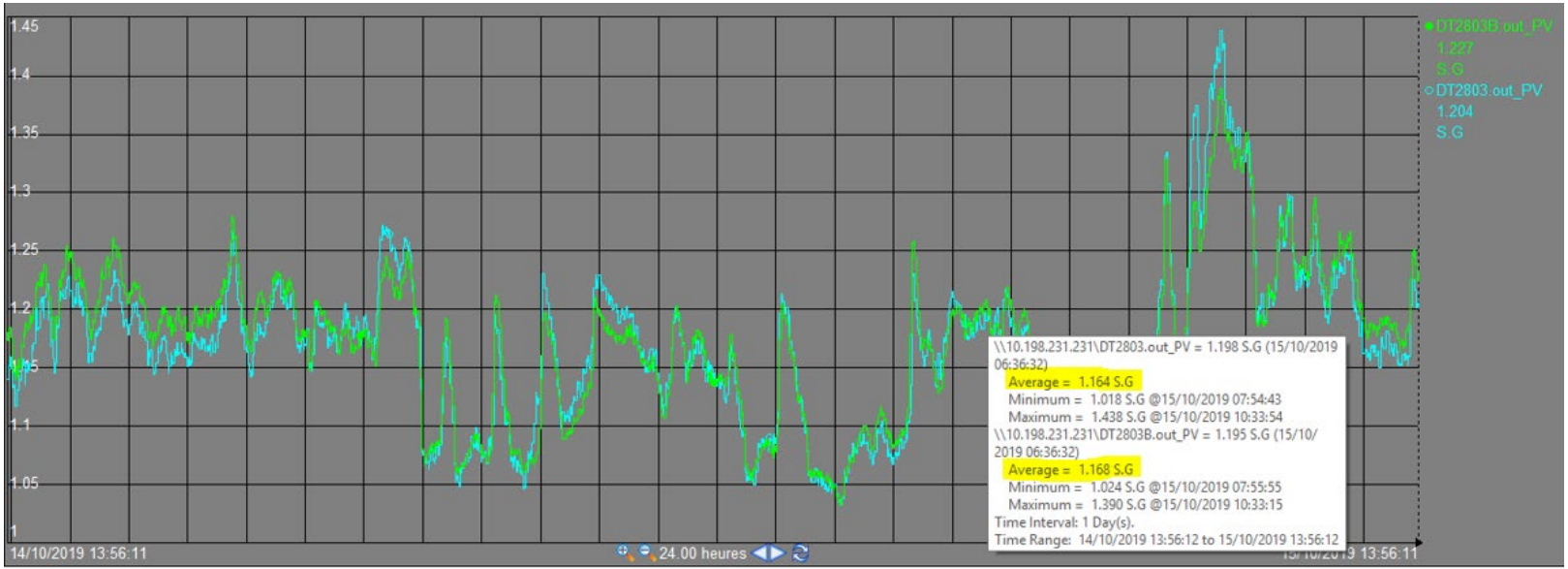
Calibration procedure:

- ✓ Water with known density under 116 and 29 psi
- ✓ Air with known density under 29 psi
- ✓ Glycerine with known density under 29 psi



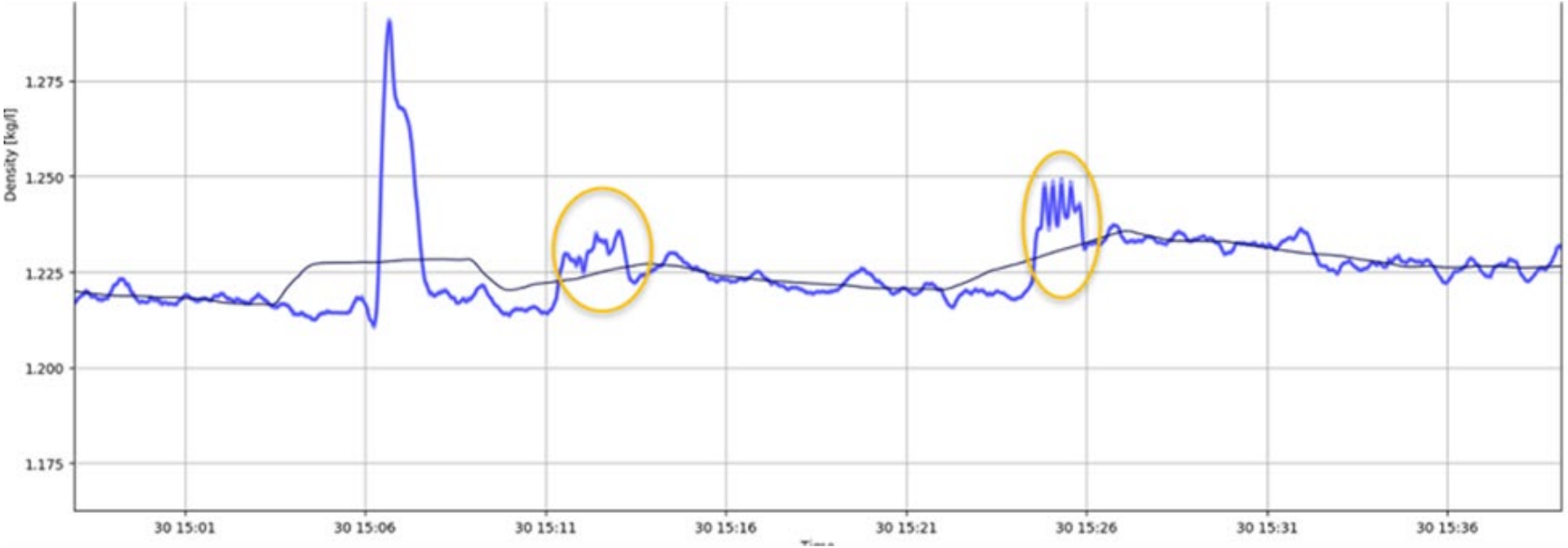
Results mining concentrate

Results with ADM (lightblue) and Nuclear meter (green))



Results dredging test site

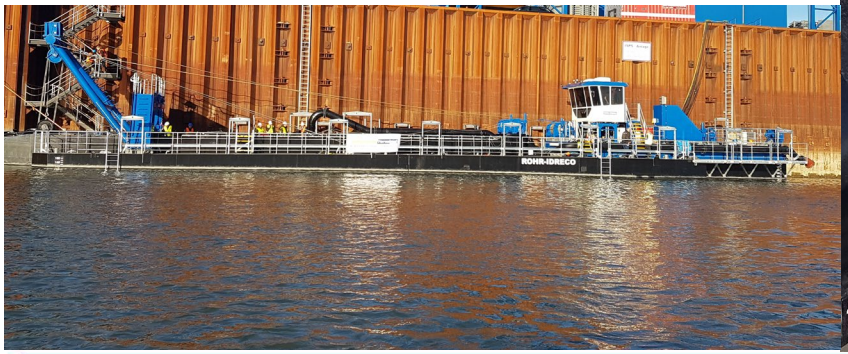
Test with ADM 4 inch inserting extra sand buckets in a fine sand slurry



Application examples

Bucket dredger

- Firmly attached ADM 18 inch to bucket dredger by Rohr-Idreco.

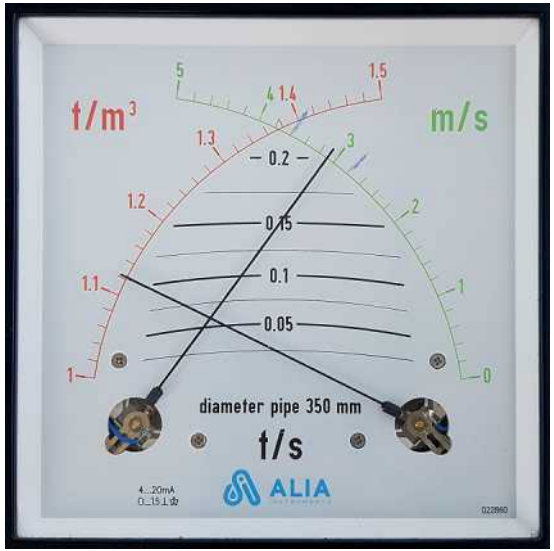


Production skid with CSD and long pipeline

- ADM 18 inch on a skid at VINCI Construction Maritime et Fluvial for a dredging project in the Rhône River near Lyon, France.

Suction dredger for aggregates

- ADM on suction dredger combined with flow meter and cross needle meter
- Increase operator performance

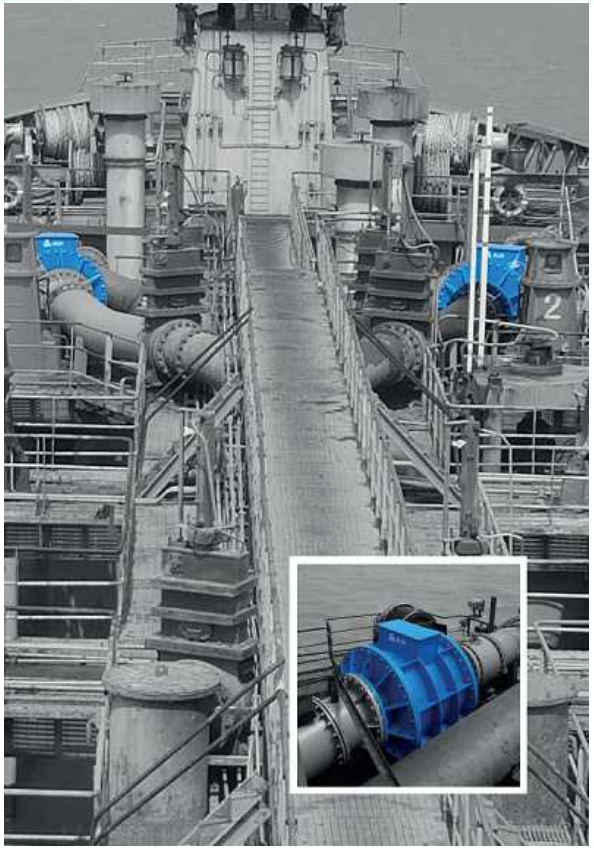


Trailing Suction Hopper Dredge

ADM 26 inch for production optimization for TSHD Adani (APSEZ)

- Operator information
- Production information for onshore

Number of saved minutes per cycle	1	minute
Average number of dredging cycles per day	8	cycles
Uptime of dredger per year	80	%
Total cost of TSHD per day	50,000	USD
Total savings	81,111	USD



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THANK YOU

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