



THE FUTURE OF AVIATION REFUELING

Presented by:

Mr. Frank Montalvo

Business Line VP

Liquid Controls, LLC



Strategic
Partner

LIQUID



CONTROLS®





- 1** LIQUID CONTROLS and SPONSLER
Lake Bluff, Illinois (USA)
- 2** CORKEN
Oklahoma City, OK (USA)
- 3** TOPTECH SYSTEMS
Longwood, FL (USA)
- 4** SAMPI
Altopascio, (Italy)
- 5** FAURE HERMAN
Houston, TX (USA)
Le Ferte Bernard (France)
- 6** IDEX Fluid & Metering Pvt, Ltd.
Mumbai (India)

LIQUID CONTROLS GROUP

Liquid Controls Group is comprised of industry leading companies focused on the movement, measurement and management of high value fluids and gasses.



ABOUT: LIQUID CONTROLS GROUP

Liquid Controls is a globally leading manufacturer of fueling data management systems, meters, electronic registers, and fuel diagnostics systems for aviation fueling operations.

Data Capture

- DMS FlightConnect®
- LCR 600 FlightConnect®
- TE 550 FlightConnect®
- DMS FleetConnect™



Metering

- Positive Displacement Meters
M7, M25, M40, M80



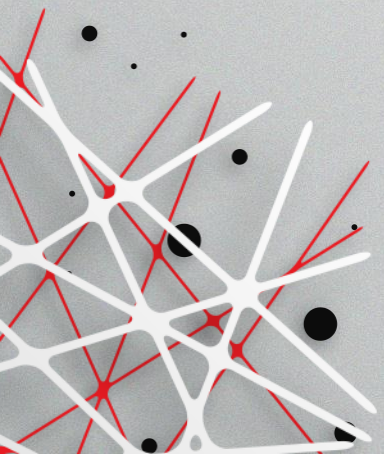
Electronic Registration

- LCR-II
- LCR 600 base
- TE 550



Diagnostics

- DP Transducer
- Slipstream Densitometer



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THREE KEY AREAS OF ADVANCEMENTS

1

Simple / Smart data mgt. systems

- incorporating electronic registration, integrated controls, and data-acquisition

2

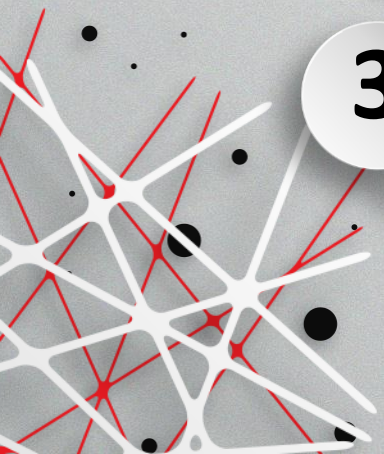
Sensor / Device integration

- fuel quality, safety, and fuel load accuracy

3

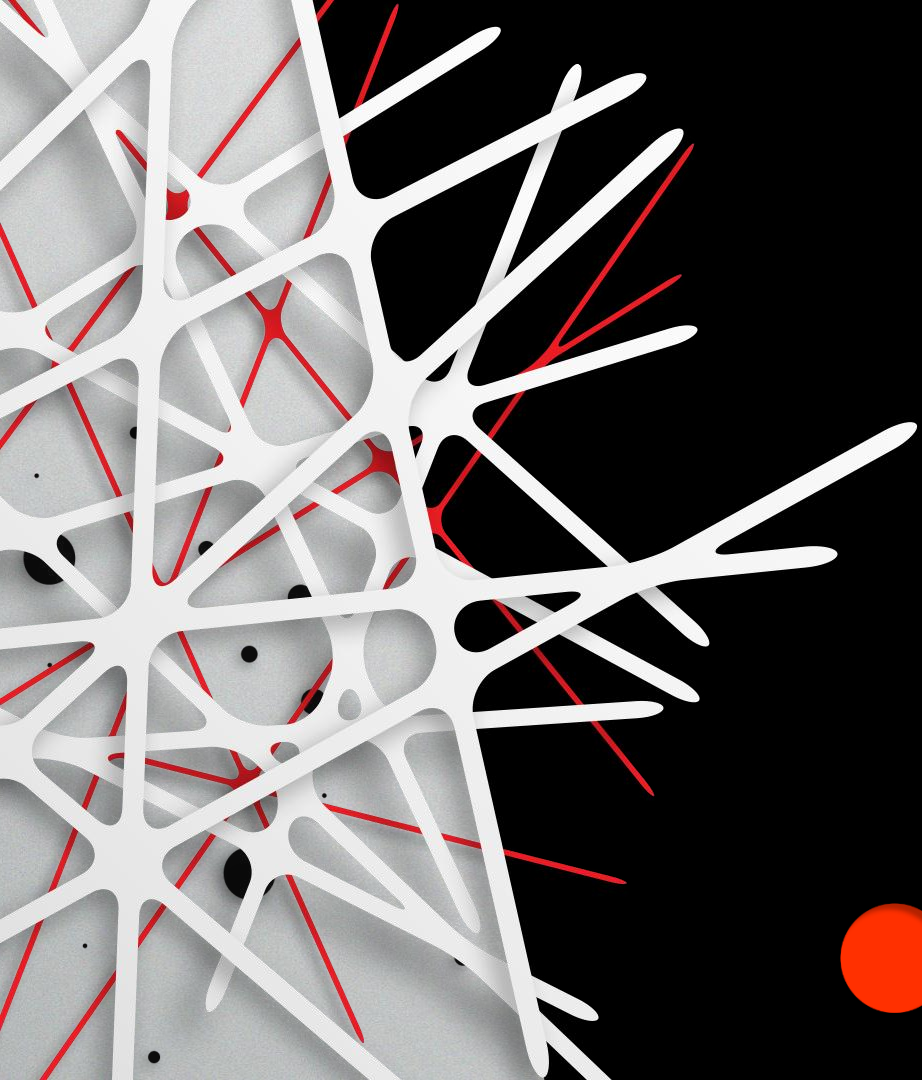
Wireless connectivity

- real-time transmission and dispatching of fuelling and fuel quality data



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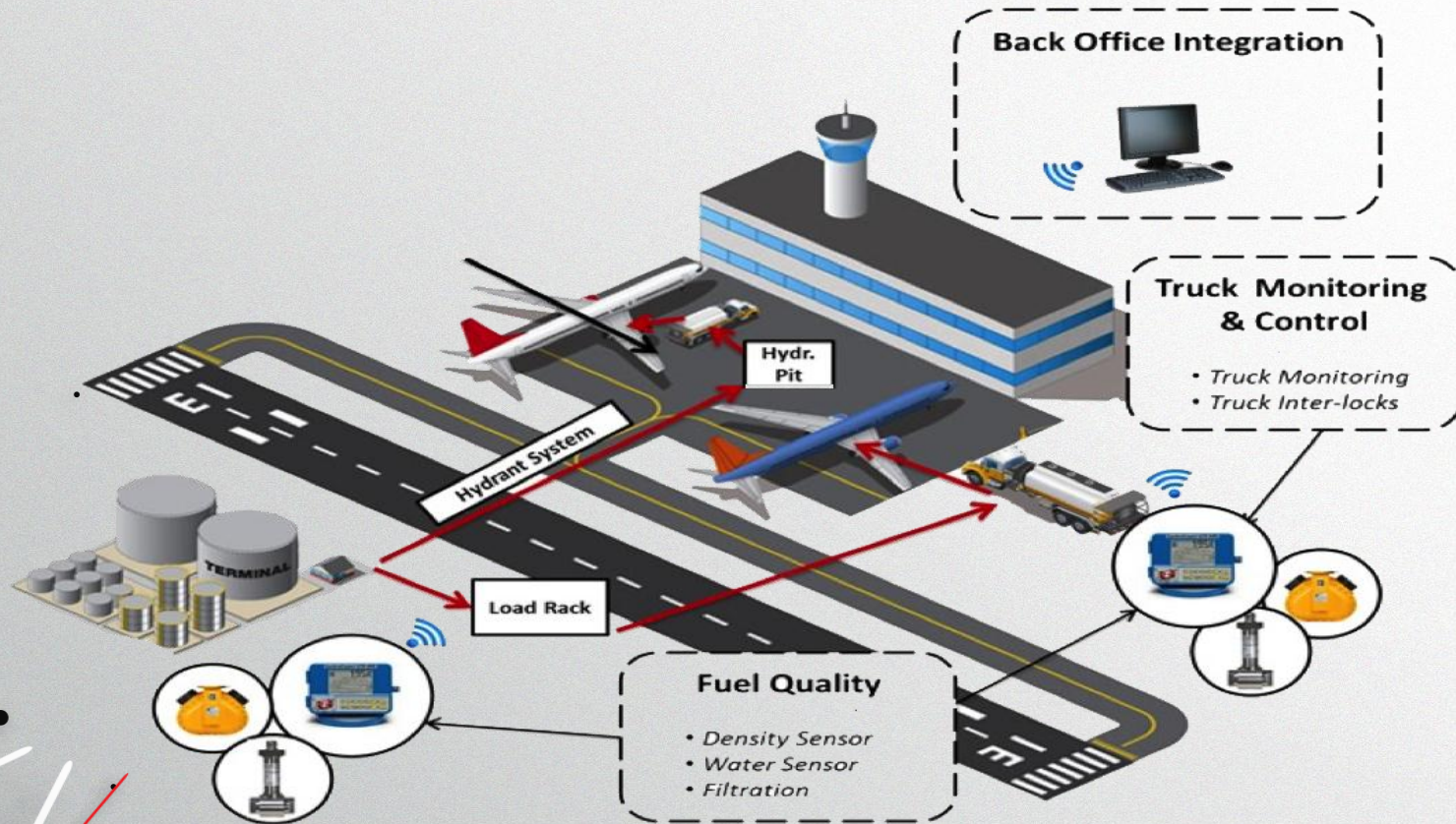
01

SIMPLE SMART



FlightConnect
WIRELESS DATA MANAGEMENT





Back Office Integration



Truck Monitoring & Control

- Truck Monitoring
- Truck Inter-locks



Fuel Quality

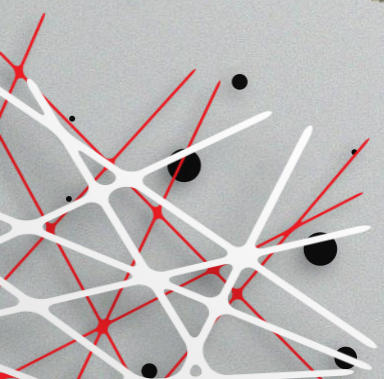
- Density Sensor
- Water Sensor
- Filtration

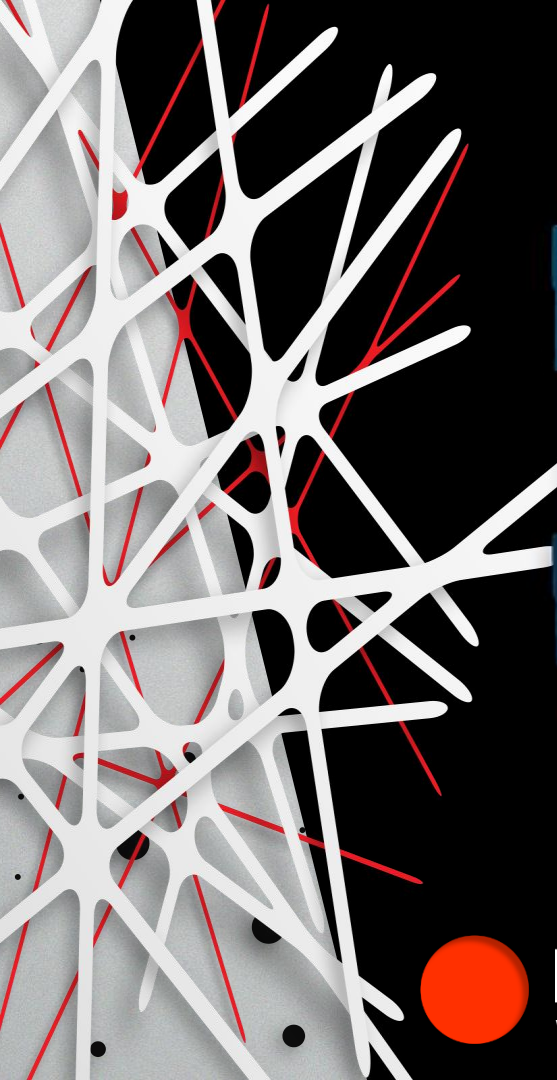


FlightConnect
WIRELESS DATA MANAGEMENT



Strategic Partner





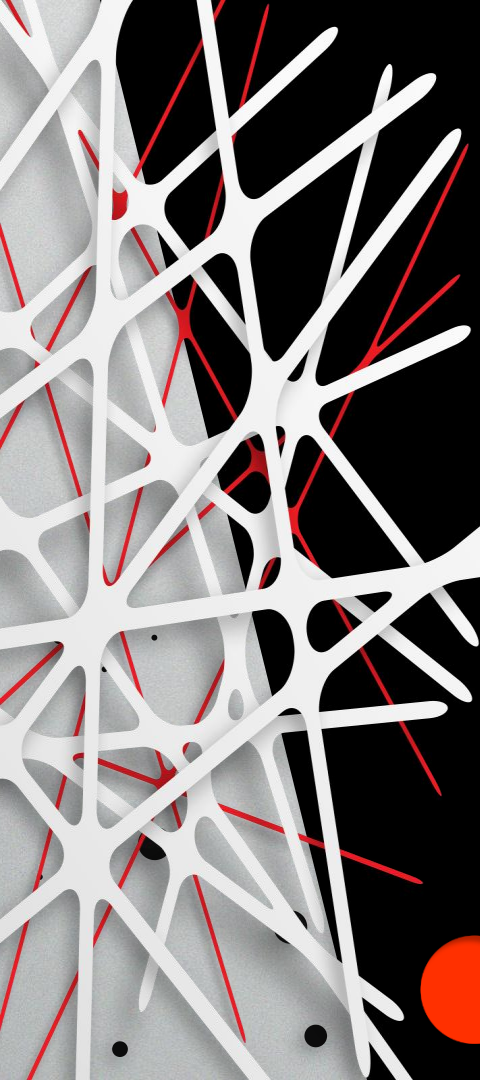
TE 550 REGISTER

FlightConnect® ready digital register for global use.

- Class 1 / Div 1 rated
- W&M approvals and IECEx & ATEX, MID approvals
- US Gallons or liters
- Volume, flow rate, and other key values visible during fueling
- Simultaneous multi-product registration.
- Universal compatibility to conventional meters.
- Permanent data storage of all events.

 **FlightConnect**
WIRELESS DATA MANAGEMENT





LCR 600 REGISTER

Electronic register with easy on-screen navigation.

- Std. aviation split screen
- W&M approvals and IECEx & ATEX approvals
- FlightConnect® ready
- US Gallons or liters
- Gross or net registration, temp. compensated or not
- Standard meter bolt pattern for universal mount.

 **FlightConnect**
WIRELESS DATA MANAGEMENT



ABOUT: FlightConnect®

FlightConnect® is a collaborative data communication system that runs on Liquid Controls LCR 600 registers.

1. Wirelessly dispatches scheduled fueling instructions to a full fleet of LCR 600 equipped refuelers or hydrant dispensers.
2. Automatically captures, backs up, and wirelessly transmits all fueling event data of your choosing to your back office.



FlightConnect® BENEFITS

1. Instant fueling data to back office accounting
2. More fueling-relevant data tracked and reported
3. Simplified fueling procedures
4. Quicker fueling turn around
5. Increased reporting accuracy and content



COMMON FUELING ISSUES



1. Lost time and inefficiency with manual reporting steps.



1. Loss of revenue due to frequently mis-keyed or inaccurately reported transactions.



1. Loss of transaction data due to lost or illegibly written tickets.



FlightConnect
WIRELESS DATA MANAGEMENT

PROBLEMS SOLVED

1. **Manual reporting steps are eliminated.**

2. **No written tickets. Paper backup tickets may be automatically printed.**

3. **Fueling data is returned to the back office wirelessly.**





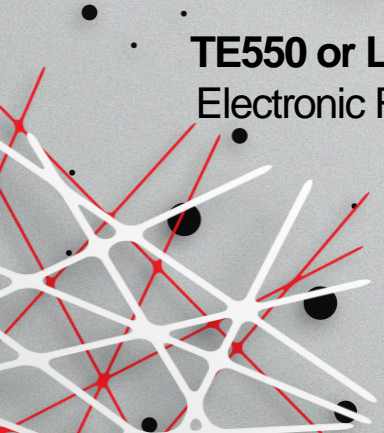
TE550 or LCR 600
Electronic Register



Cloudgate
Wireless Modem



Computer
Back Office



FlightConnect
WIRELESS DATA MANAGEMENT

HARDWARE



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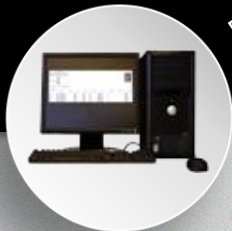


ICX
ENERGY & FUELS

DISPATCH

1 START

BACK OFFICE
DISPATCH PUSHED



DATA CONVERTER



HANDSHAKE

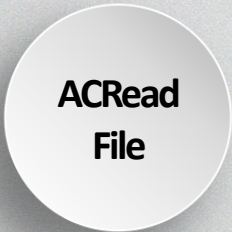


COMMUNICATION

DISPATCH
RECEIVED



FUELING COMPLETED
TRANSACTION STORED
DATA PUSHED



DATA CONVERTER



HANDSHAKE



COMMUNICATION

DATA RECEIVED
LEDGER ENTRY
FINISH

REPORT



FlightConnect
WIRELESS DATA MANAGEMENT



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FlightConnect® DATA FIELDS

Over 20 user configured points of data.

```
LIQUID CONTROLS
AVIATION FUELING SOLUTIONS
105 ALBRECHT DRIVE
LAKE BLUFF, IL 60048
847-296-1050

AIRCRAFT SERVICE RECORD

TICKET NUMBER          08215465121

AMERICAN AIRLINES
FLIGHT NUMBER          801
AIRCRAFT TYPE          B787
TAIL NUMBER            N500AN

ORIGIN                  DFW
DESTINATION             FEK

TRANSACTION             FUEL
FUEL TYPE               JET A1
TRUCK NUMBER           801
FUELING LOCATION       D28A
FUELER                  FRANK MONTALVO
-----
METER NUMBER           801      AVIATION 1
SALE NUMBER            4121
TIME START             07/05/15 12:45:52
TIME END               07/05/15 13:12:14
START COUNT            0 GALLONS
END GROSS COUNT        12150 GALLONS
GROSS DELIVERY         12150 GALLONS
START TOTALIZER        8232188 GALLONS
END TOTALIZER          8244288 GALLONS
DP 2.8 PSI @           300 GPM
CORRECTED DP           3.4 PSI
-----
TOTAL FUELING          12150 GALLONS

AVERAGE FLOWRATE      792 GPM
AVERAGE TEMPERATURE  72.8 OF
AVERAGE DENSITY       6.82 LB/G
TOTAL WEIGHT            82868 LB
RECEIVED BY _____
```

- Invoice Number
- Start Date and Time
- End Date Time
- Fueler Name or ID
- Unit ID # (Truck#)
- Customer
- Flight Number
- Tail Number
- Aircraft Type (A380...)
- Origin and Destination
- Total Delivery Amount
- Average density
- Transaction Type
- Fuel Type (Jet A1, AvGas...)
- Fuel Location
- Start Totalizer (Non-Resetting)
- End Totalizer (Non-Resetting)
- dP w/ Maximum Flowrate
- Average Flowrate
- Average Temperature
- Total Weight
- 3 Misc. User Defined Prompts
- Additive Injection
- Free water / particle counts



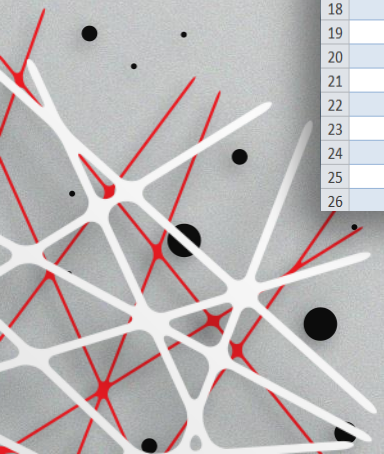
FlightConnect
WIRELESS DATA MANAGEMENT

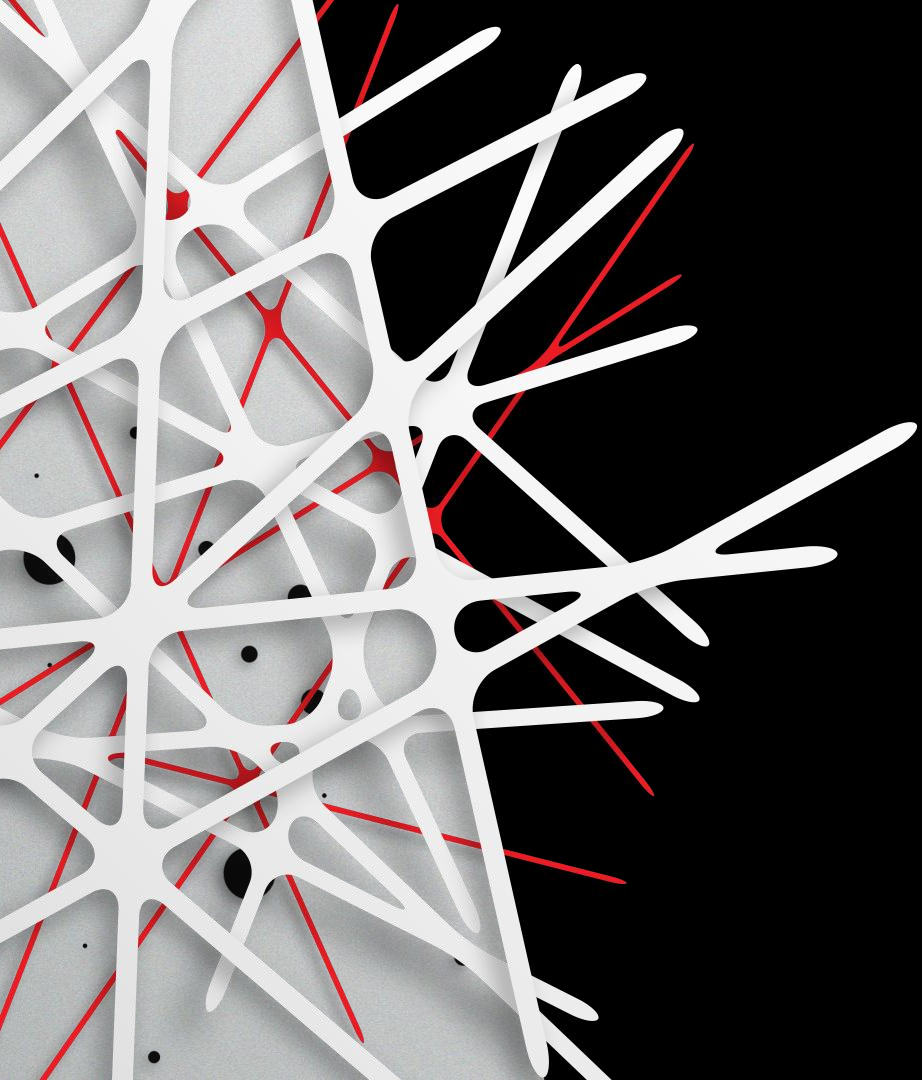


BACK OFFICE ACCOUNTING

Your customizable data fields are automatically populated in your software in

	F	G	H	I	J	K	L	M	P	S	T	U	X	Y	Z
1	record	trans	invoice	dispatch	account	aircraft	tail	location	flight	requestedVolume	meter1GrossStart	meter1GrossEnd	deliveryTotal	beginDelivery	endDelivery
2	3	FUL	71012342025	0	988	A319	167			900	3271	4171	900	07/10/15 12:40:51	07/10/15 12:43:52
3	3	RCR	71012342026	0	988	A319		AS		0	4171	4322	151	07/10/15 12:44:38	07/10/15 12:45:12
4	3	FUL	71012342027	0	257	A330-300	898	AS		150	4322	4472	150	07/10/15 12:46:07	07/10/15 12:46:40
5	3	DFL	71012342028	0	297	737-700	343	C1		0	4472	4713	241	07/10/15 12:47:46	07/10/15 12:48:37
6	3	FUL	71012342029	1	390	A319	321	AS	123	250	4713	4963	250	07/10/15 12:57:51	07/10/15 12:58:44
7	3	FUL	71012342030	0	139	A319	167	AS		120	4963	5083	120	07/10/15 13:07:28	07/10/15 13:07:55
8	3	FUL	71012342031	2	257	A319	342	AS	234	200	5083	5283	200	07/10/15 13:10:54	07/10/15 13:11:37
9	3	FUL	71012342032	7	80	747-400	554	AS	3421	100	5283	5383	100	07/10/15 13:15:27	07/10/15 13:15:50
10	3	FUL	71012342033	0	409	747-400	106	AS		100	5383	5483	100	07/10/15 13:17:57	07/10/15 13:18:20
11	3	FUL	71012342034	4	176	A380-800	3232	AS	2122	200	5483	5683	200	07/10/15 13:59:19	07/10/15 14:00:02
12	3	FUL	71012342035	0	176	A380-800	16	AS		0	5683	5689	6	07/10/15 14:31:02	07/10/15 14:31:07
13	3	FUL	71012342036	8	125	A319	33	AS	234	100	5689	5789	100	07/10/15 15:40:19	07/10/15 15:40:42
14	3	FUL	71012342037	7	390	A319	12312	AS	23	13	5789	5802	13	07/10/15 15:43:33	07/10/15 15:43:40
15	3	FUL	71012342038	5	176	A380-800	232	AS	2311	1000	5802	5867	65	07/10/15 15:44:24	07/10/15 15:44:40
16	3	FUL	71012342039	0	176	AA320	59	C15		10	5867	5877	10	07/10/15 15:45:37	07/10/15 15:45:43
17	3	FUL	71012342040	12	607	777-300ER	1231	C7A	443	15	5877	5901	24	07/10/15 15:49:20	07/10/15 15:49:45
18	3	FUL	71012342041	1	1	737-200	123	AS	123	150	5901	6057	156	07/10/15 15:56:56	07/10/15 16:07:29
19	3	DFL	71012342042	2	1	767-300	131	AS	11	35	6057	6092	35	07/10/15 16:08:10	07/10/15 16:08:36
20	3	FUL	71012342043	3	125	777-300	222	C19	131	100	6092	6128	36	07/10/15 16:09:17	07/10/15 16:09:27
21	3	FUL	71012342044	6	232	A330-300	2332	G11B	2313	100	6128	6148	20	07/10/15 16:10:53	07/10/15 16:11:00
22	3	RCR	71012342045	4	125	777-300		CW		100	6148	6154	6	07/10/15 16:11:35	07/10/15 16:11:40
23	3	FUL	71012342046	5	173	777-300	1331	G16	22	100	6154	6160	6	07/10/15 16:12:15	07/10/15 16:12:19
24	3	FUL	71312342047	7	157	A330-300	234	G11B	4334	200	6160	6360	200	07/10/15 16:14:55	07/13/15 21:31:39
25	3	FUL	71312342048	0	157	A330-300	8	G11B		100	6360	6460	100	07/13/15 21:36:47	07/13/15 21:37:44
26	3	FUL	71312342049	9	200	747-400	123	G15	321	100	6460	6571	111	07/13/15 22:57:18	07/13/15 22:57:56





02

INTEGRATED SENSORS

Slipstream™ Densitometer

Fuel density measurement for
fuel weight reporting accuracy.

Provides real-time fuel data:

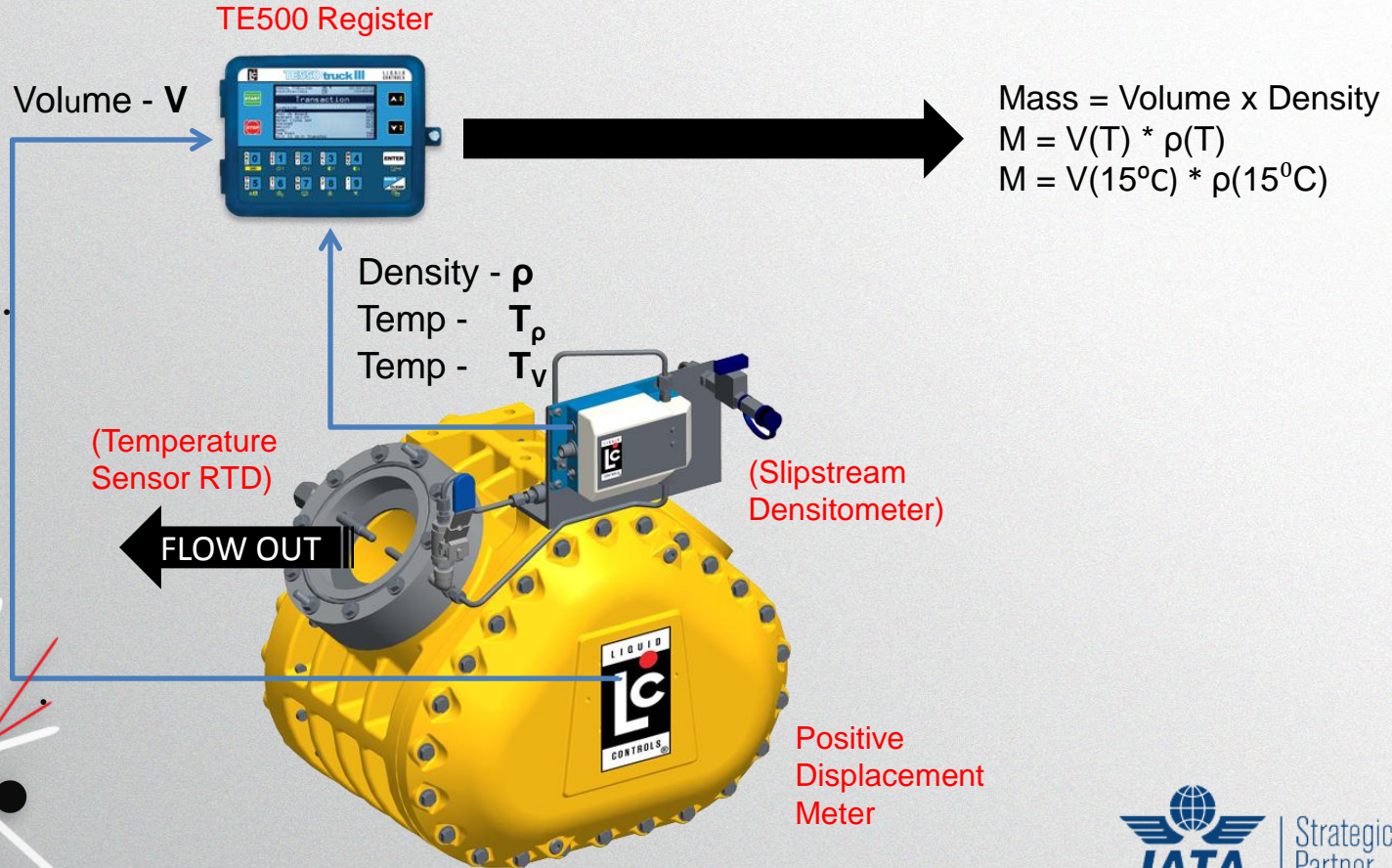
- Mass
- Density
- Concentration
- Temperature
- Viscosity
- Measures liquid density
between 0.6 to 1.3 g/cc



 SlipStream™
Densitometer



SDMS INSTALLATION



BENEFITS OF SDMS DENSITOMETER SYSTEM

1

Optimized fuel loading for airline flight dispatching operations.

2

More accurate measurements of fuel mass loaded onboard and provides improved accuracy in reporting carbon dioxide (CO²) emissions per flight under the European Union (EU) Environmental Trading Scheme (ETS) regulatory requirements.

3

Saves fuel shrinkage (losses) with improved fuel data & management.



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BENEFITS OF SDMS DENSITOMETER SYSTEM

4

Automatic reporting of density/mass data electronically to the refueling operator **eliminates errors caused by** manual measurements and manual data input by operators.

5

The Slipstream™ densitometer enables the refueling operator to **better monitor fuel uplifted** to the aircraft by simultaneously comparing aircraft meter readings TE500 or LCR600 register readings using the same unit of measure.



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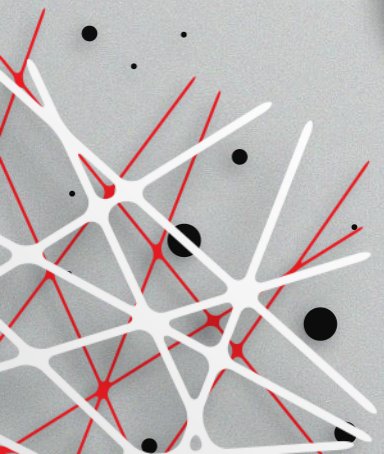
BENEFITS OF SDMS DENSITOMETER SYSTEM

6

Aircraft fuel represents 20% to 30% of an airlines annual operating spend. Excess fuel results in dead weight and added costs to the airline.

7

Actual data suggests that minimizing the overage by as little as 250 pounds (140 liters/37 gal.) per flight would result in real savings up to \$150,000 per day for the airline.



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Temperature Compensation

Electronic Temperature Compensation (ETVC)

- Eliminates effect of product temperature
- Platinum RTD 4 wire probe
- Samples temperature 2 times per second
- Programmed base temperature and standard API tables



ETVC Electronic Temperature Compensation

JIG



Electronic dP transducer

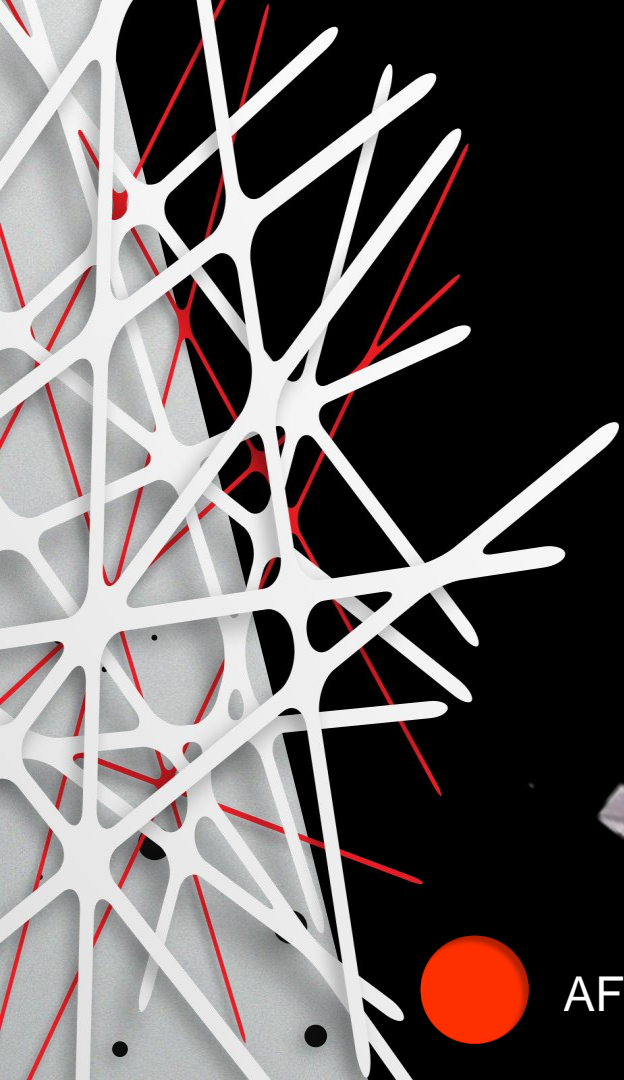
Electronic differential pressure system provides automatic shutdown of fueling operation when threshold is reached.

- Complies with JIG bulletin 58
- Compatible with LCR600 and TE550 electronic registers
- Optional auto shut down
- Designed specifically for aviation fuelling applications.



LCdP Transducer





Water Detector

**Inline, online free water
detection system.**

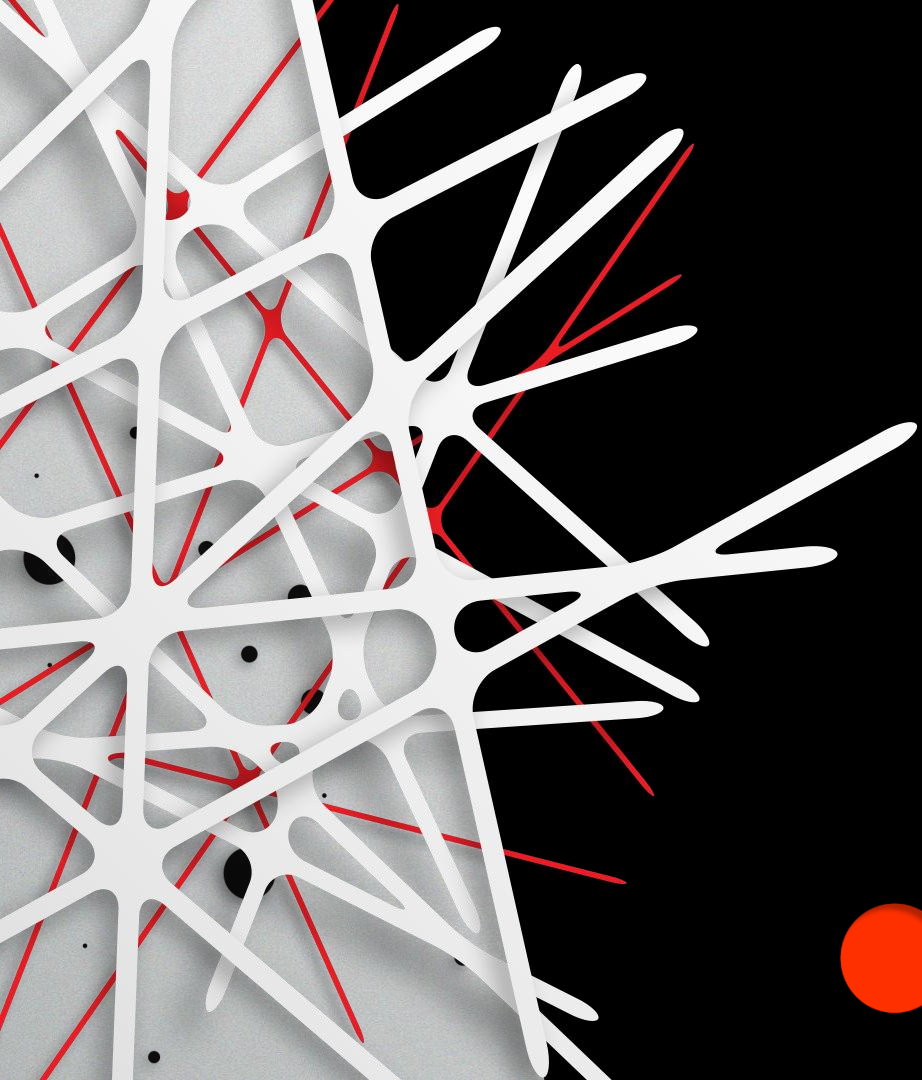
- Detects water in ppm
- Allows trend analysis
- Detects water slugs



AFGUARD

JIG





03

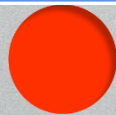
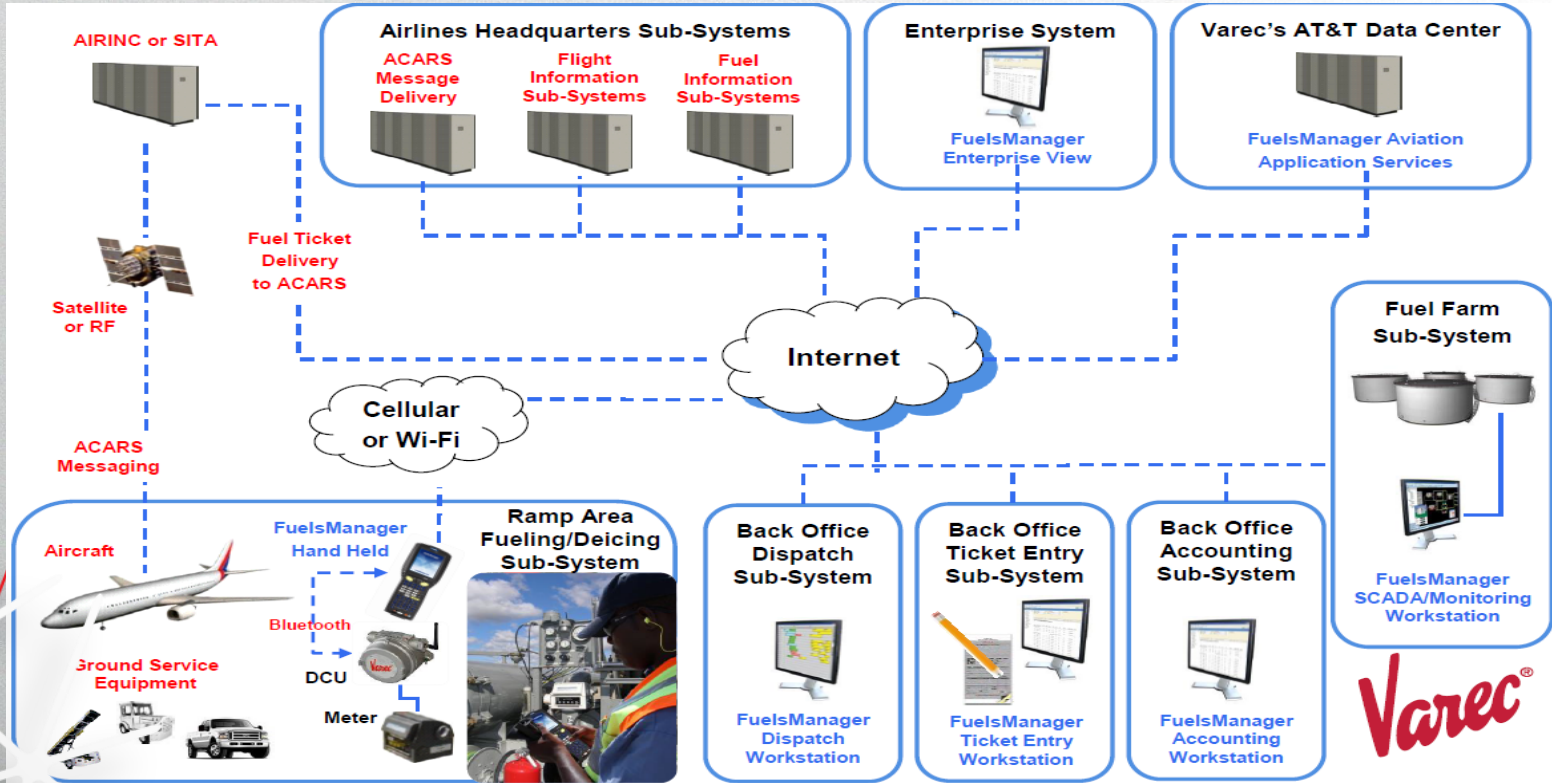
WIRELESS CONNECTIVITY



FlightConnect
WIRELESS DATA MANAGEMENT



COMPLETING THE DIGITAL PATH...



Real-Time Data Transmission



Strategic Partner





*Electronic Fuel Tickets
are Immediately Available*



*Enables
Reconciliation & Reporting*



*Enables ACARS Messaging
...of Fuel Tickets*



THE FUTURE OF AVIATION REFUELING

THANK YOU!



Strategic
Partner

Presented by:

Mr. Frank Montalvo

Business Line VP

Liquid Controls, LLC

LIQUID

The logo for Liquid Controls, featuring a large, stylized "LC" with a red dot above the "C".

LC

CONTROLS®

The logo for INEX Energy & Fuels, featuring the word "INEX" in a bold, blue, sans-serif font with a stylized "X" that incorporates a flame-like shape, with "ENERGY & FUELS" in a smaller font below it.

INEX
ENERGY & FUELS