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An innovative system for leakage prevention in domestic water systems

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Summary

- Water Use in North America
- Challenges facing North America
- The water efficiency solution in domestic water systems
- The LDS: an innovative system for leakage prevention in domestic water systems
- New developments
- Conclusions

Water Use in North America

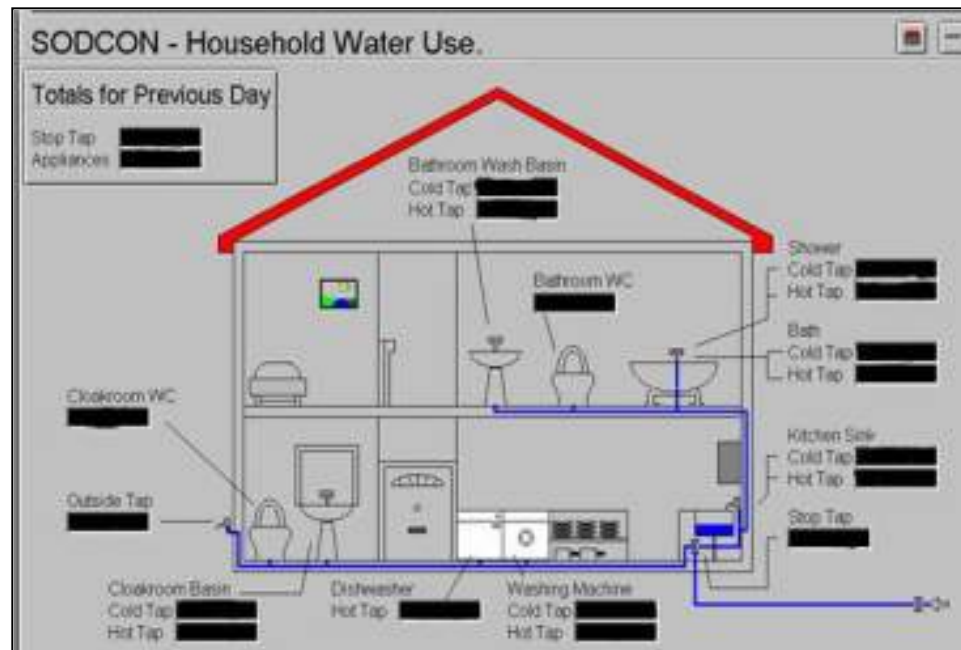
- If you web search for the least water-efficient country in the world you will find the U.S.A. at the top of the list followed closely by Canada.
- Residential only = 114 Gpdc (435 Lcd) includes irrigation
- Only indoor residential use = 70 Gpdc (265 Lcd)
- How much water do Americans really use?
- Are we really that wasteful?
- **Where Does The Water Go? :**

Source: Veritec.ca.

An AWWARF Study (1999) reported that leaks represent 14% of water used indoors

Ever wonder where all the water goes in a typical home. Most of it goes down the toilet. Surprisingly, very little of it is used for actual drinking. These statistics do not account for water used outdoors.

- 1) Toilets 26%
- 2) Clothes Washers 21%
- 3) Showers 17%
- 4) Faucets 16%
- 5) **Leaks 14%**
- 6) Baths 2%
- 7) Dishwashers 2%
- 8) Other 2%



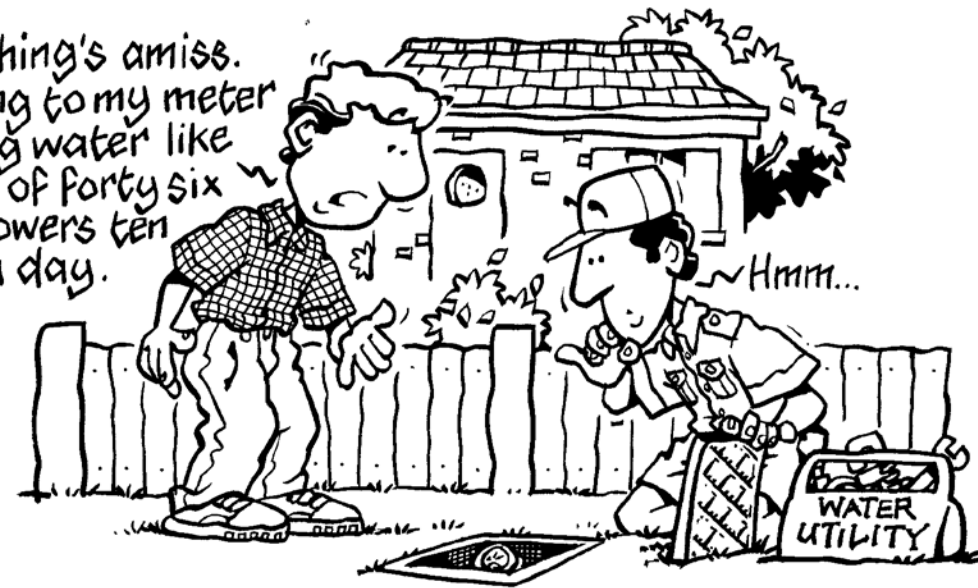
Are our meters reading accurately?

Sometimes NO

Sometimes YES



Something's amiss. According to my meter I'm using water like a family of forty six that showers ten times a day.



Courtesy: WideBayWaterCorp.

Challenges facing North America

- Fixtures and appliances in older homes are much less efficient (wait for natural replacement or accelerate via offering rebates/incentives)
 - toilets flush with 4.22 to 5.28 U.S. Gallon (16 to 20 L)
 - clothes washers use 40 U.S. Gallon per load (150 L/load)
- Water is inexpensive in most North American communities – priced far lower than its value
- North America is a big place, we like “BIG” - big yards, big gardens, big pools, big bath tubs, big showers (i.e., multiple showerheads)

Challenges (con't)

- Few municipalities/water agencies in North America know with any certainty how much water is being used by each of their customer sectors (poor quality billing data)
- Not every customer is metered and often water agencies do not do the metering themselves.
- Water bills typically don't educate consumer (e.g., how much water do you use, how much should you use)

Challenges (con't)

- Very few North Americans know how much water they use - most people think they use only 7 or so U.S. Gallon per day (30 or so litres per day)
- Too many decisions are made based on inadequate, outdated, or poor quality data.
- Efficiency is considered a “soft” solution, building more pipes is the preferred “hard” solution

Is green building the answer?

- Only if it addresses water properly
- US Green Building programs very weak on water
- **30%** or more savings are possible if built correctly
- **4 Megaliters per day** can be saved by 2015 with more efficiency in new buildings in the US alone



LDS (Leak Detection System): is a solution to avoid damages and loss caused by improper consumption of water

The LDS (Leak Detection System): Field of application

LDS has been developed for the domestic “water saving” especially in presence of drippings.

The LDS System, offers a wide range of important benefits to the users:

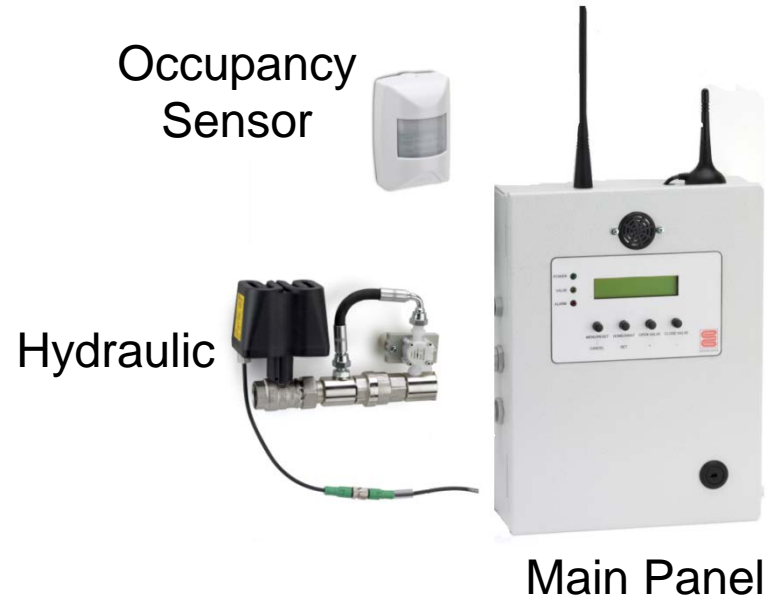
- **Detects anomalous water consumptions.**
- **Prevents flooding and damages connected to pipe ruptures** in the domestic water supply systems.
- **Avoids damages and loss caused by improper consumption of water**, caused by users distractions or temporary bad functioning of the water system (faucets, tap left open, damages in the toilet water flush , etc.).
- **Avoids small leaks caused by dripping.**



The LDS (Leak Detection System): Description

It consists in a complete package that includes:

- Hydraulic device
- Main panel
- Presence sensors



The LDS system includes a dial-up device able to send voice or text messages indicating the kind of problem detected and water supply shut off.

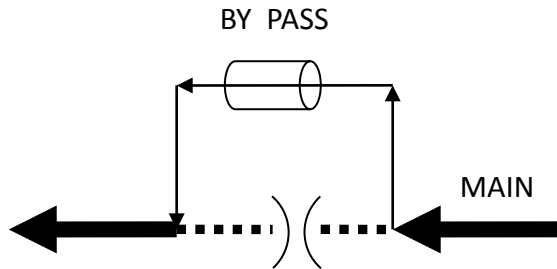
The **LDS** (Leak Detection System): the Hydraulic device

- The hydraulic part represents the core of the project. To achieve the best solution, the highest sensitivity level of the entire system shall be guaranteed so to avoid any water rate reduction during the normal operation. The target is represented by the dripping detection that corresponds to 0.003 GPM.
- The by pass solution combines a high sensitivity turbine with the cracking pressure of the check valve that intercepts the main flow rate. The check valve is normally in the “off position” until the pressure drop value > 0.35 psi (0.025 bar).

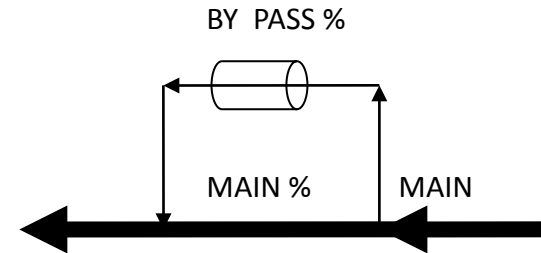
The LDS (Leak Detection System): the Hydraulic device

Two are the hydraulic conditions that may be represented:

**A) Pressure drop < 0.35 psi
(0.025 bar)= small leaks**



**B) Pressure drop > 0.35 psi =
big leaks or normal usage.**



- Condition A) indicates of the dripping condition or small leaks.
- In order to give some practical values, with ref. to a ¾" device/pipe, the dripping is in the range of
- 0.000 – 0.025 gpm corresponding to one faucet (tap) dripping.
- Over 0.0025 gpm, the check device moves gradually opening up to 100%.

The **LDS** (**L**eak **D**etection **S**ystem):

Characteristics 1/2

The system constantly evaluates water usage patterns and can recognize Micro flows (generally dripping) and Normal flows .

The LDS has two different settings (automatically determined through the occupancy sensors):

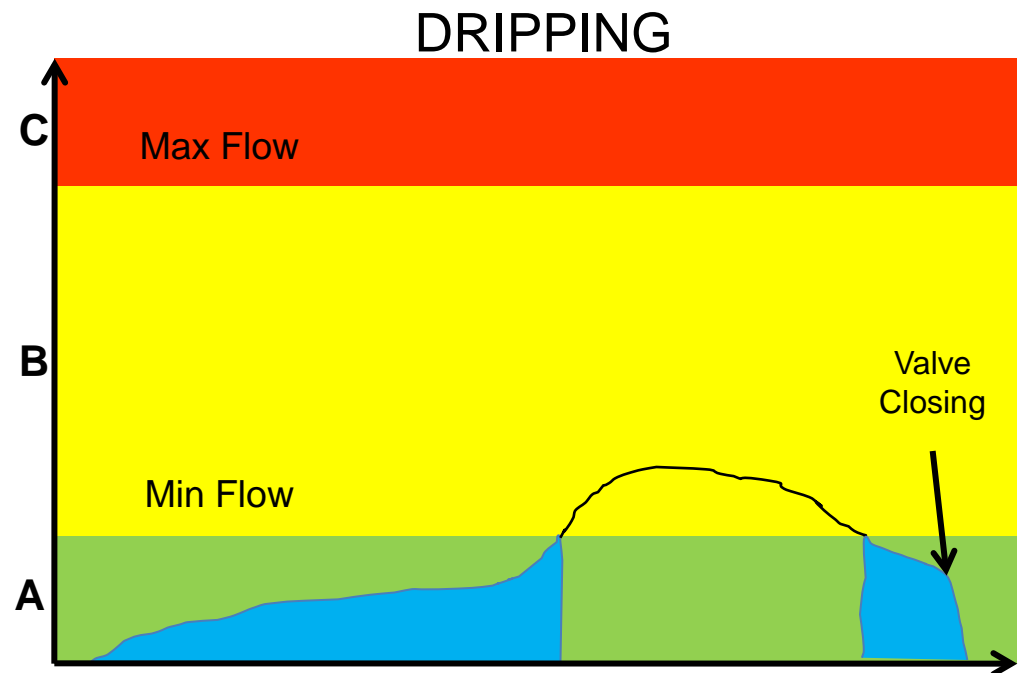
- **Home** (dripping are detected and alarm activated when volume is over set parameters) or
- **Away** (no flow is allowed unless programmed with a timer).

Depending on the diagnosis results and on the mode the system will activate some procedures proportional to the degree of alarm.

The LDS (Leak Detection System): Characteristics 2/3

MODE “home”

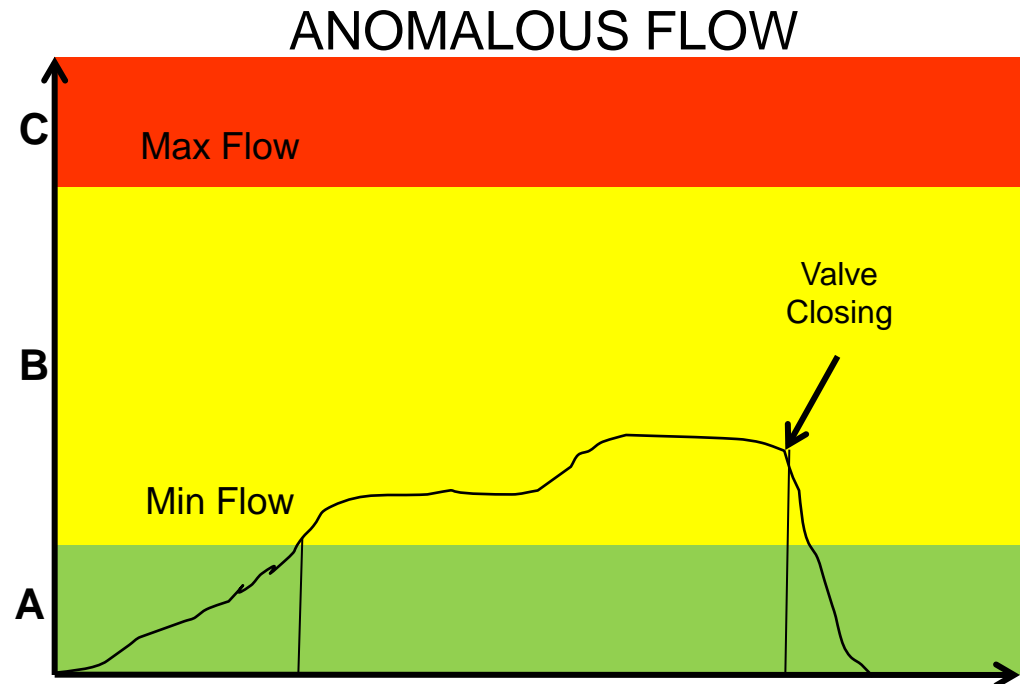
- IDENTIFIES DRIPPING
- QUANTIFIES THE VALUE (Volume)
- REACHED THE MAX VALUE:
 - ACOUSTIC ALARM
 - Valve closing (OPTIONAL)



The LDS (Leak Detection System): Characteristics 2/3

MODE “away”

- QUANTIFIES THE VALUE (Time and Volume)
- IDENTIFIES ALL KIND OF FLOWS
- REACHED THE MAX VALUE (TIME OR VOLUME):
 - ACOUSTIC ALARM /Valve closing
 - TEXT MESSAGE: SMS-Mail



The **LDS** (**L**eak **D**etection **S**ystem):

Characteristics 3/3

The actions vary from a minimum level (local, acoustic alarm) to a maximum level (shut off water supply).

The LDS system includes a dial-up device able to send voice or text messages indicating the kind of problem detected and water supply shut off.

The user may disable the system for specific tasks that exceed the safety limits (car washing, garden or patio watering).

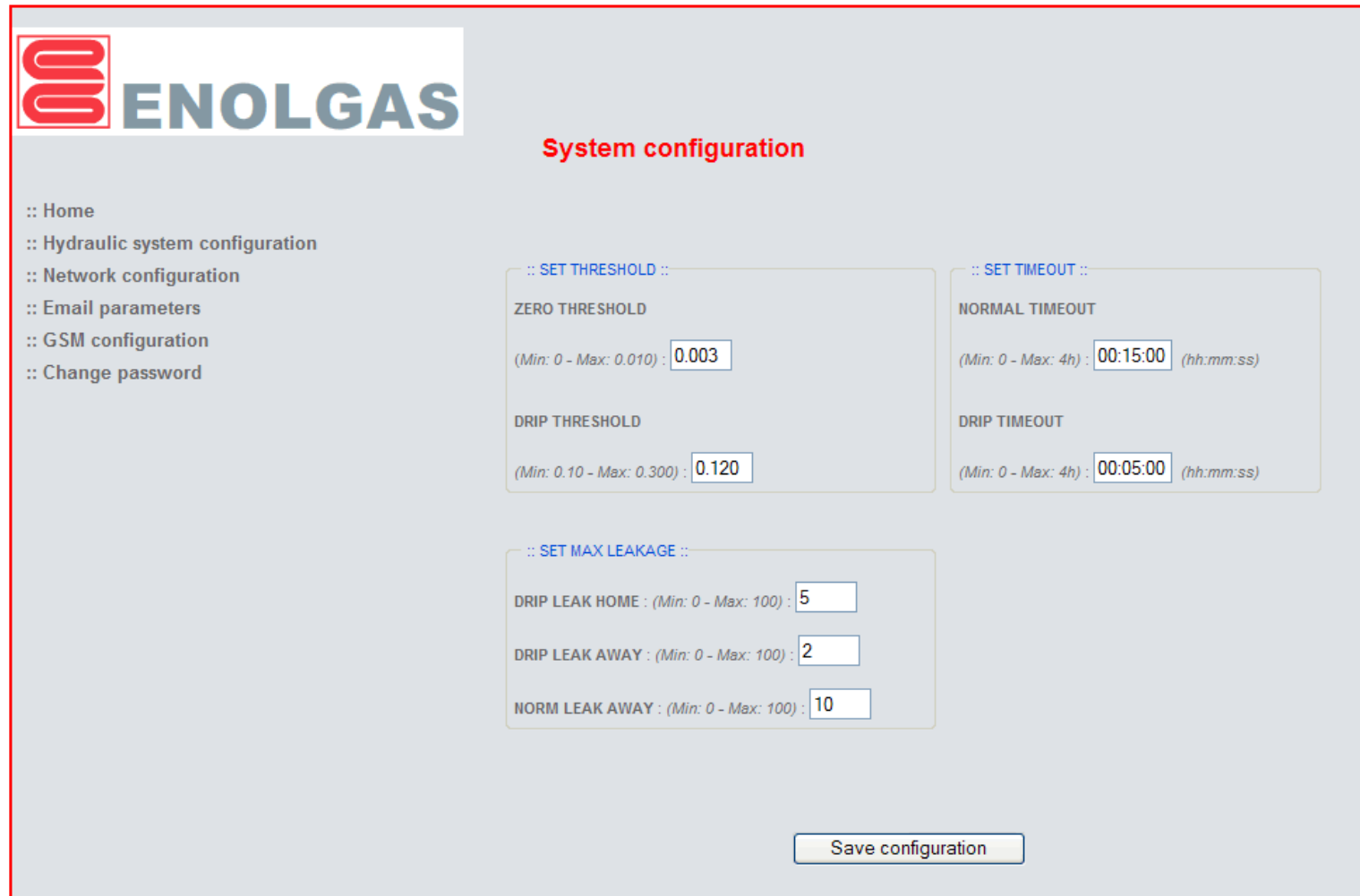
Home page: Hydraulic system configuration

- This page allows to change system status and to open/close the inlet valve

The screenshot shows the ENOLGAS web interface for hydraulic system configuration. On the left is a navigation menu with the following items: Home, Hydraulic system configuration, Network configuration, Email parameters, GSM configuration, and Change password. The main content area is titled "System status" and displays three indicators: a green dot for "Power IN-LINE", a yellow dot for "Valve open", and a red dot for "Alarm - Drip". Below these indicators is a "Counter" section showing "Lettura Contatore : 000000.0 (gal)". At the bottom of the interface are three buttons: "Open valve", "Close valve", and "Reset status".

Home page: Hydraulic system configuration

This page allows to set/modify Threshold, Timeout and Leakage level



The screenshot shows the ENOLGAS web interface for system configuration. It features a navigation menu on the left, a main configuration area with three panels, and a 'Save configuration' button at the bottom.

ENOLGAS

System configuration

- :: Home
- :: Hydraulic system configuration
- :: Network configuration
- :: Email parameters
- :: GSM configuration
- :: Change password

:: SET THRESHOLD ::

ZERO THRESHOLD
(Min: 0 - Max: 0.010) :

DRIP THRESHOLD
(Min: 0.10 - Max: 0.300) :

:: SET TIMEOUT ::

NORMAL TIMEOUT
(Min: 0 - Max: 4h) : (hh:mm:ss)

DRIP TIMEOUT
(Min: 0 - Max: 4h) : (hh:mm:ss)

:: SET MAX LEAKAGE ::

DRIP LEAK HOME : (Min: 0 - Max: 100) :

DRIP LEAK AWAY : (Min: 0 - Max: 100) :

NORM LEAK AWAY : (Min: 0 - Max: 100) :

The **LDS** (Leak Detection Sytem): Benefits

The usage of the LDS is easy and practical and allows to obtain the following benefits:

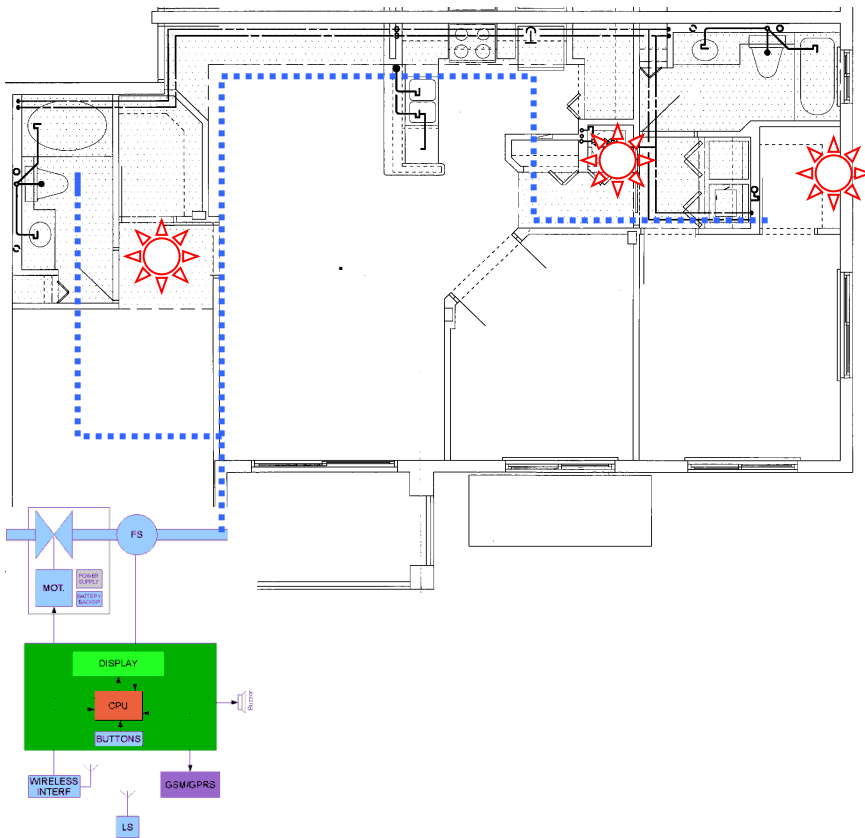
- Limiting the damages caused by big water leakages, protecting the property and the furniture of the user.
- Reducing the cost of insurance policies.
- Allows a savings in the consumption of the potable water as well as in energy saving when the possible leaks are connected to the consumption of the hot water.

The **LDS** (Leak Detection Sytem): Case studies

A - Domestic Customer

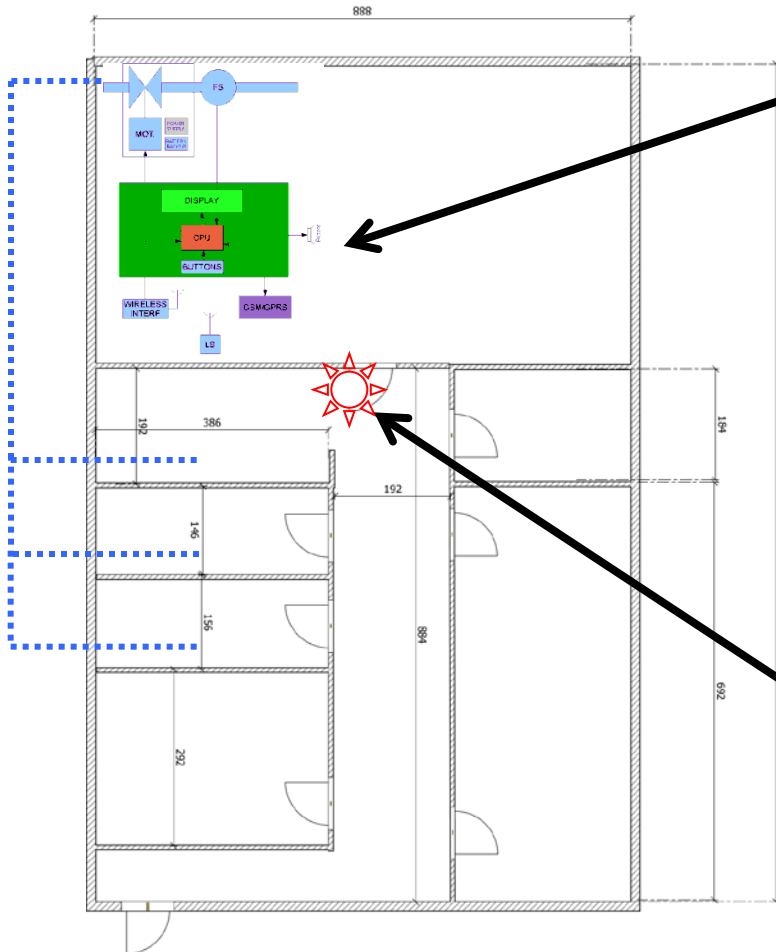
B - Offices/Industry

Case study A: Domestic Customer Boca Raton, Florida, US



- The Hydraulic device is installed downstream the meter at entry point.
- The meter, equipped with pulse emitter, can be connected to the Main panel allowing remote reading.
- Wireless sensors are installed at taps and other points of use of the house.
- Wet sensors can be eventually connected to the Main panel.
- LAN version includes a software for remote monitoring of consumptions.

Case study B: Offices Fort Lauderdale, Florida, US



The Hydraulic device is installed downstream the meter at entry point.



Wireless sensors are installed at taps and other points of use of the office.

The **LDS** (Leak Detection System): New developments

The new release now includes:

- LAN and GSM output interface
- Ethernet port and Enolgas gateway (building main desk interface)
- 12 V DC new SOM.

New Options:

- Sub metering and water consumption diagnosis (software)
- Self instrument diagnosis

All components are certified according to American standards
(including motion sensors wireless frequency)

Conclusions

- U.S.A. is the **least** water-efficient country in the world
- Fixtures and appliances in older homes are much less efficient
- Leaks represent a large component of water used indoors
- The LDS System allows users to **save water and money** by:
 - **Detection of anomalous water consumptions,**
 - **Preventing flooding and damages connected to pipe ruptures** in the domestic water supply systems.
 - **Avoiding damages and loss caused by improper consumption of water,**
 - **Avoiding small leaks caused by dripping.**



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THANKS !

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