



## Airtightness testing: Status and trends in competent tester schemes in Germany

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## Introduction – What's the FLiB?

**FLiB e. V.** (Fachverband für Luftdichtheit im Bauwesen e. V)

German Association for Airtightness

[www.flib.de](http://www.flib.de) / [www.flib.eu](http://www.flib.eu)

Founded in **2000**

in the preparation procedure of the coming Energy Savings Directive EnEV

**284 Members** (2013)

Mainly air tightness testers (app. 80 %)

Manufacturers of sealing components

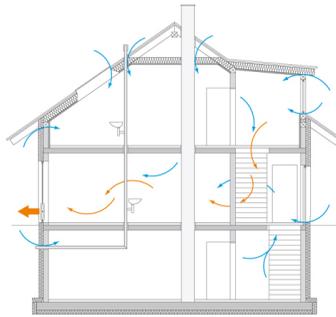
Manufacturers of test equipment



## Introduction – Why do we need the FLiB?

### Goals

- Improve the importance of air tightness tests of the building envelope



Grafik: FLiB e.V.

- Establish a **good / right test procedure** for air tightness tests acc. EN 13829 in order to be able **to compare the results**

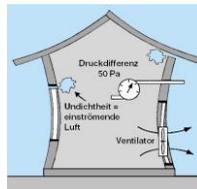


## Introduction – What does the FLiB?

### How does the FLiB do that?

- Publications (public and specialized press, www, book)
- Technical guidelines and standardization
- **Certification schemes**

- Air tightness testers



- Craftsmen





## History of FLiB certification

**EnEV 2002** - national implementation of EPBD – **defined  $n_{50}$ -limits**

Test acc. DIN EN 13829

Without ventilation system  $n_{50} \leq 3,0$  ACH

With ventilation system  $n_{50} \leq 1,5$  ACH

**No qualification requirements for testers**



Association for Air Tightness in Buildings (FLiB e.V.) started to work out the qualification procedure

**In 2002 FLiB e. V. started its certification program** for airtightness testers

Certification procedure costs

ca. 1.900,- EUR including the education program at the training facilities

770,- EUR certification alone (FLiB members pay less)



## Future

**EnEV 2014** still will not make testing mandatory

Testing mandatory is mandatory if

Ventilation systems are considered in EP calculations

Using Funding programs by KfW ("State owned" bank)



## FLiB certified leakage testers

Only the **tester gets certified** not the company

To be able to be certified leakage testers shall have a technical education as **engineer, technician or master craftsman**

To produce good test results testers must be able to understand what they do

Testers shall proof their testing ability

1. Attending a **FLiB approved education program** or
2. send **5 test reports acc. EN 13829** to the examination board or
3. do **2 tests with two different FLiB - certified testers**



## FLiB certified leakage testers - certification procedure

Certification contains of two parts

1. Theoretical test  
**Theoretical background**  
of air tightness testing
2. Practical test  
**Ability to perform the test**  
in the right way with own equipment



Recertification after 3 years



## Other Certification schemes

Some other certification procedures have been established in Germany after the FLiB but **FLiB certification** is one with a **very high reputation**.

*Recognition of one funding organisation in Hamburg that make it mandatory to have an airtightness test been performed by a certified tester such as a tester with FLiB certificate*

Other certificates are available:

- Some are given out after a short education from some manufactures
- Some others are more sophisticated and follow the rules that have been established by the FLiB



## Other Certification schemes

**One other larger certification program** (~160 certified testers) that was focussed rather on testing craftsmen **resigned this year**

The demand for certification of air tightness testers was too low to be profitable

FLiB is a non-profit organization and FLiBs statutes define to spread good testing quality

**FLiB offers recertification of testers** certified by this scheme with a round robin test



## FLiB approved certification schemes

To give an overview of certification procedures that produce well educated leakage testers FLiB e.V. decided to check out other systems.

- To have an independent classification of the different certificates, other certification institutes can have their certification procedure been checked by the FLiB e.V.
- If the procedure meets the standards set by FLiB testers are able to recertify at the FLiB e. V.
- Yet, only **one certification could meet the standards** and is accepted by FLiB e. V.



## Progress of certification

Since 2002 around **230 FLiB certificates** have been passed out.

The figures varied over the years

The demand for certification is not strong but steady: **~ 20 to 30 testers per year**

No certification is needed to start testing

Many testers on the market, that do not perform test on a regular basis

Only some testers realize certification helps in the market

Only one funding program makes testing by certified tester mandatory

Future

- **Testing quality** is very important in **judging i.e. leakages** - refurbishments
- Testing **large buildings** needs knowledge and experience



Thank you very much for your kind attention

# Status and trends in competent tester schemes - the Czech Republic

Jiří Novák

ASOCIACE  
BLOWER DOOR\_CZ



Association Blower Door CZ

Czech Technical University, Prague

## situation

### airtightness requirements

- CSN 73 0540-2
- TNI 73 0329
- TNI 73 0330

compliance  
check  
not  
required

- EP programme  
„Green savings“

### test procedures

- CSN EN 13829
- no official guidelines  
beyond CSN EN 13829
- sampling method for  
multifamily resid. buildings  
(TNI 73 0330)



- no official intention to control the reliability of test results
- **no competent tester scheme**

➔ request for a quality guarantee x risk of incorrect practice

## Association Blower Door CZ (A.BD.CZ)



[www.asociaceblowerdoor.cz](http://www.asociaceblowerdoor.cz)

41 technicians

22 companies

2 companies accredited



- supervision and quality control of the professional activities of the members
- support of knowledge exchange and lifelong learning of the members
- development of measuring procedures and their implementation
- cooperation with state authorities

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## A.BD.CZ - control of tester competence

- members obligations:
    - observation of ethical code required
    - violations of ethical code = disciplinary procedure
    - observation of internal guidelines for test procedure...
    - **mandatory participation to round-robin tests**
- ↓
- membership plays a role of a competent tester scheme...

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## ensuring reliability of test results

- airtightness testing in the framework of EP programme Green Savings (cooperatin with state authorities)



- detailed gudelines specifying the test procedure beyond EN 13829
- common form of test report

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20	podrobné provedení měření tlaku	AN	NEP		
21	podrobné provedení měření tlaku	AN	NEP		
22					
23	<b>měření zařazení</b>				
24	typ měření	The Green House - Nová Ves u Mladé Boleslavi, Jiří Novák			
25	AN	NEP	NEP	NEP	
26	datum poslední kalibrace				
27					
28	<b>příprava budovy před měřením</b>				
29	průběh měření podle ČSN EN 13829				
30	dotyky od asistentů měřícího				
31					
32					
33					
34					
35	prvek	plánováno v projektu	plněno v budově	zodpovězeno příslušně	komentář
36	průběh měření				
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## round-robin tests

- comparison of test results given by:
  - different technicians
  - different measuring devices
  - under similar conditions



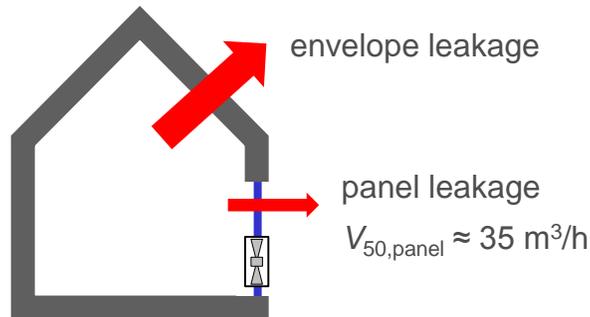
- control of the equipment...
- control of the technicians competence
- rough estimation of reproducibility of test results
- ... good mean to understand the source and nature of measurement errors



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## round-robin tests - equipment control

- leaky blower door panel

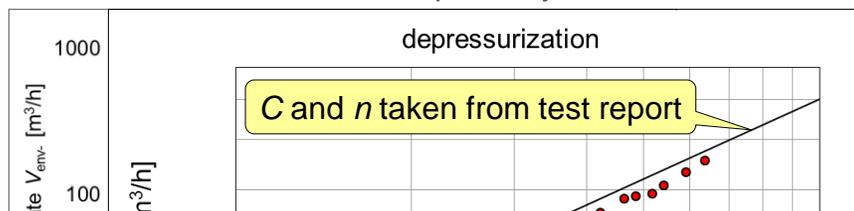


- standard single-family house:  $V \approx 400 \text{ m}^3$
- error in  $n_{50}$  due to panel leakage:  $\delta_{n50} \approx 0,09 \text{ h}^{-1}$

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## round-robin tests - equipment control

- an error in test evaluation – probably a software error



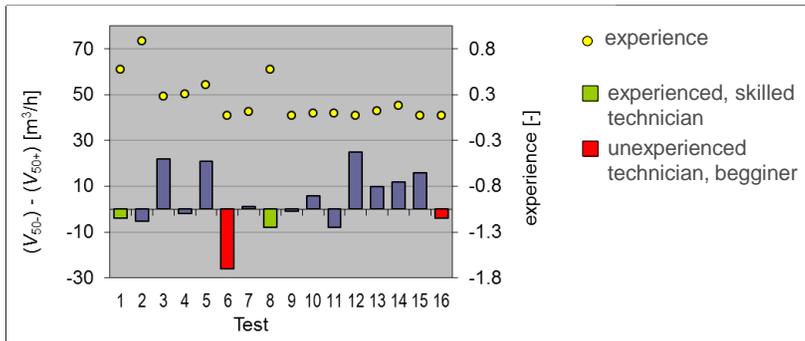
**1 accredited company (CSN EN ISO 17025) uses a measuring device with this sw!  
(limits of accreditation process...)**

— linear regression      • measured data

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## round-robin tests - competence control

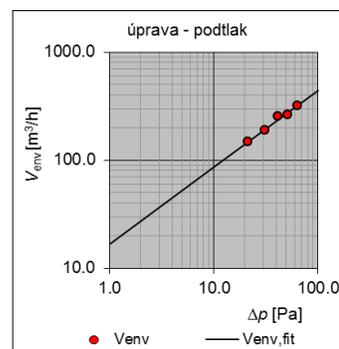
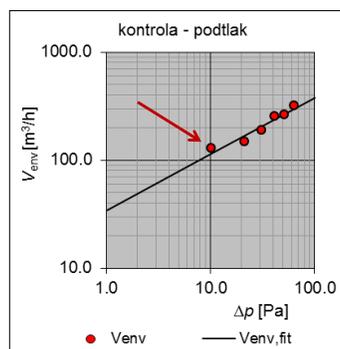
- influence of technicians skills on the test results
- assumptions:
  - competence and skills grow with experience
  - experience grows in time and with the number of tests



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## round-robin tests - competence control

- evaluation of test reports - lack of knowledge:
  - values out of physical limits (e.g.  $n < 0.5$ )
  - zero-flow  $\Delta p$  limits exceeded
  - outlying points



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## round-robin tests - results



measured air flow rate  $V_{50}$  [m<sup>3</sup>/h]:

	2010	2012
min. value	231	254
<b>average value</b>	<b>250</b>	<b>277</b>
max. value	285	304
<b>standard deviation</b>	<b>20</b>	<b>15</b>

- rough estimation of reproducibility:  $\pm$  OK...
- control of equipment: questionable
- test results may be influenced by changing conditions
- conditions are similar, but still changing...

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## lessons learnt

- common form of test report:
  - easy check (can be automated)
  - easy data collection (database)
- control of equipment
  - pressure gauges calibration– necessary but not sufficient
  - other parts of measuring apparatus should be checked as well (including sw)
  - influence of changing climatic conditions should be avoided (round robin in lab. conditions)

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## lessons learnt

- control of technicians competence:
  - control of practical execution of a test (skills)
  - control of evaluation of measured data

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## quality control scheme

- certification of persons (technicians)
- certification body – A.BD.CZ + independent third party
  - the third party examines the competence of the applicant
  - A.BD.CZ confers its certificate („mark“) to the successful applicant
- the validity of the certificate will be limited in time (recertification necessary)
- the third party – VÚPS Certifikační společnost s.r.o.:



- accredited certification body
- accredited laboratory – airtightness testing of building components

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## quality control scheme

- 1st certification:
  - evaluation of test reports
  - examination – theoretical background
  - examination – practical competence
  - proof of equipment calibration
- recertification:
  - evaluation of test reports
  - examination – practical competence (random control at building site)
  - participation to the round-robin test (in a laboratory facility?)
  - proof of equipment calibration

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## quality control scheme

- other obligations (the same as the A.BD.CZ membership):
  - observation of ethical code
  - observation of test procedure guidelines
  - use of the common test report form
  - supply the test results to a database

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## conclusions

- consistent quality of testing practice and reliable results need
  - well defined rules - test procedures
  - control of compliance with the rules – a competent tester scheme
- the competent tester scheme proposal:
  - provides with detailed guidelines
  - covers the important aspects of quality control (equipment, practical skills, knowledge, follow up, ...)
- barriers to its implementation:
  - it is an ambitious project...
  - its credibility is not guaranteed by state authorities...
  - how to convince the market that it represents real quality?
  - no training programme...

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thank you for your attention...

...questions?

**Jiří Novák**

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# HISTORY OF THE EXTENT TO SEAL AIR IN FRANCE

2007 to 2011 the birth of a business

## the meeting

Jean-Louis CAPOU

Diagnostician of the  
Bordeaux region  
Cabinet JLC Consultant

Patrick FRANCAIN

Diagnostician on  
Niçoise region  
SIRTEME

The meeting switches and blower and infrared thermography  
become the subject

# Enchainement

- ▣ The idea is that way.
- ▣ The men left but the ideas remain and advance time.
- ▣ When an idea is born in us, we are never alone.



# Creating a group

After several visits to our European neighbors

A new adventure begins.

At that time, a site talking about this new phenomena, the Cabinet HOFMMAN & DUPONT Belgium.

We meet, he supports us at least interesting, since we agreed to provide equipment, yes nobody wants to market in France equipment whose software works in English in German.

# Actime

association Française

we create AACTIME (associative form)

Grouping first professional blower and thermography.

Jean- Louis CAPOU was the first President and this for 3 years.

Participates in the creation of the Club permeability

[www.syneole.org](http://www.syneole.org)

Lonely no-!! Mais voilà  
nous ne sommes pas les seuls  
sur cette planète



*L'idée fait des BÉBÉS*



& les

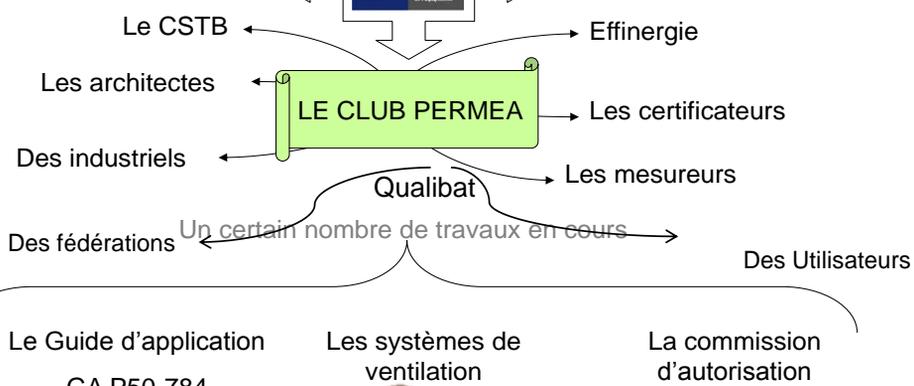


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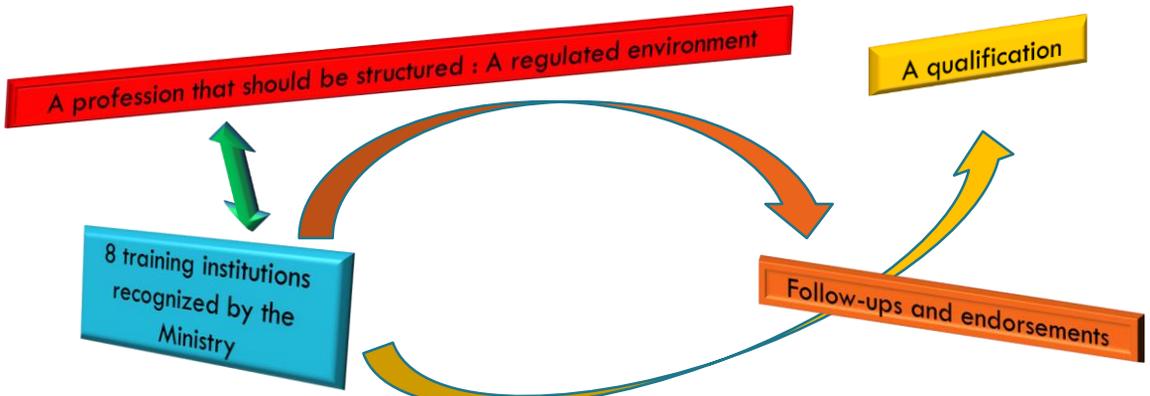


Conférence QUALIBAT Le 15 mars 2012 « Salon Aquibat Bordeaux

# Innovation



# The measurement framework



# Syneole

Syndicat Professionnel de la Perméabilité à l'Air

Nous créons SYNEOLE (Syndicat professionnel)

1<sup>er</sup> syndicat de professionnel de l'infiltrométrie et de la thermographie.

Jean-Louis CAPOU est le premier Président.

Représentation au Club Perméa et à QUALIBAT

[www.syneole.org](http://www.syneole.org)



## Arrival QUALIBAT

After a few years of operation temporary, but essential the CAP (Committee authorization) gives way to Qualibat

A more professional organization.

A commission.

A repository, which gives legitimacy to the occupation.

Nomenclature " 8711, measuring "



LA COMPÉTENCE POUR RÉFÉRENCE



Conférence QUALIBAT Le 15 mars 2012 « Salon Aquibat Bordeaux

# The syndicate



# our presence





- Present at the 8711 Committee
- Have participated in the development of QUALIBAT 8711 and 8721 QUALIBAT repository



- Represented the club Permea
- Several club members are members Synéole



- Member of the association EFFINERGIE bringing developing labels energy performance of buildings



PROMOTELEC



- Consulted for the study of contentious issues
- Member of the certification committee



- Intervene as counsel during meetings on the assessment of insurance- risk



- Participate in meetings



# Actions

## Continuity of actions +

- ✎ Increase our representation
- ✎ A news letters (the site)
- ✎ A technical surveillance
- ✎ The technical sessions
- ✎ Legal assistance



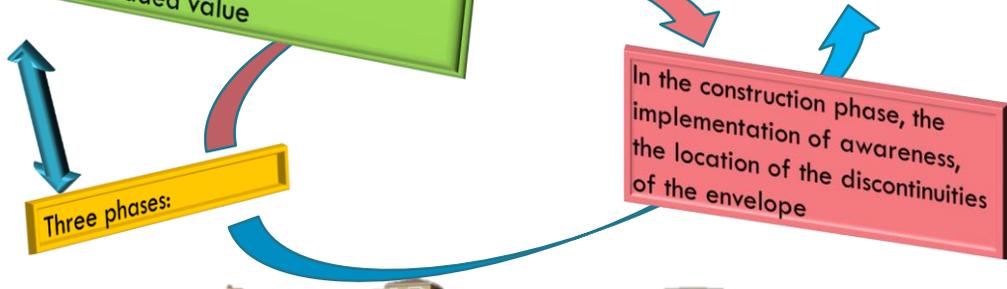
# control

Beyond measure, rather as a control  
Outside the penalty (the result)  
The meter can provide real added value

Upstream awareness of different trades

In the construction phase, the implementation of awareness, the location of the discontinuities of the envelope

Three phases:



# Today



Pursuant to the non-residential (even without obligation measurement)

Pursuant to 01/01/2013 counted for residential

Schedule quality approach VII



Villas (diffuse or clustered)	apartment building	non-residential
0,60	1,00	No measurement required

effinergie+

Applicable for residential or non-residential



# Warning

The mission of the measurers 8711

Framed by reference, measure and give a result (Q4 Pa-surf) and performing a location of discontinuities in the envelope.



Pour cette mission il doit avoir contracté une RCP

Pour tout autre mission



Le mesureur doit être couvert par une couverture appropriée

Conseil, préconisation, solutions, produits...



## Conclusion

A Syndicate is a social and political movement of workers, organized to defend their interests, impose changes and sometimes transform the mode of production.

Members are not necessarily all good friends all sharing the same ideology, on the contrary, it is the exchange and constructive disagreement that arises intelligence.

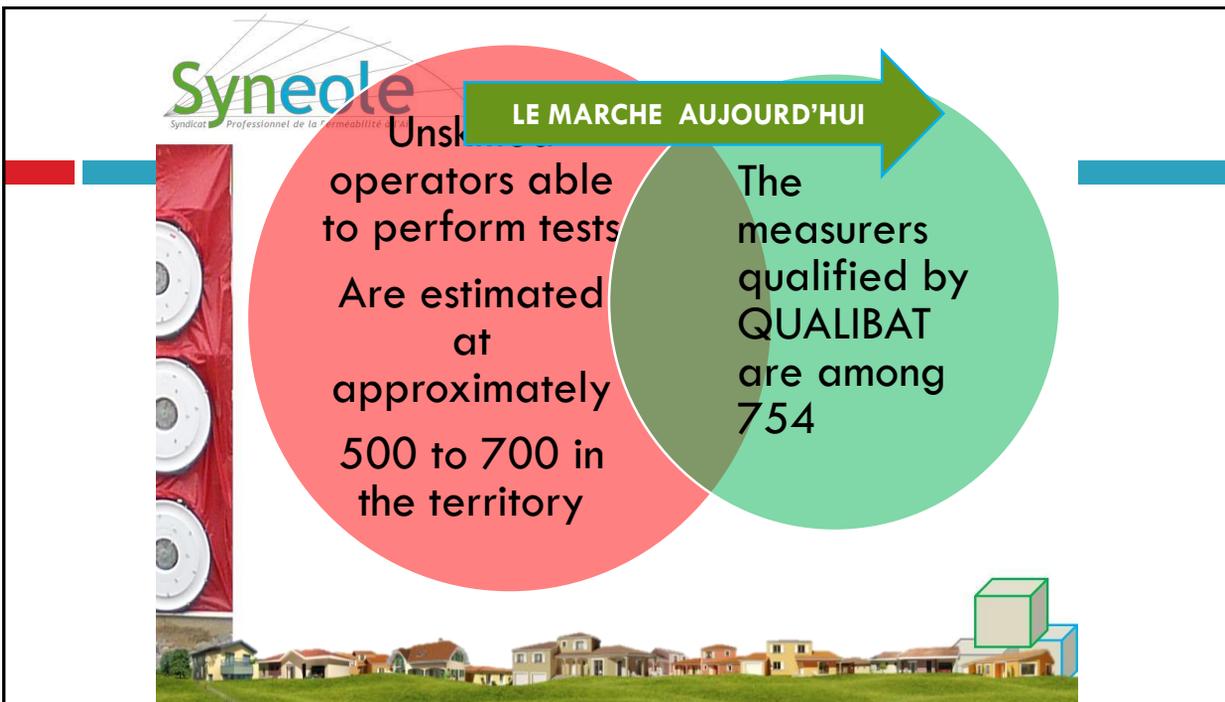
The profession needs each of us to put it in place and that build character, you can ignore it, in any case it will be set up with or without the rest of us are already there, why refuse be actors of our future.



### LE MARCHE AUJOUR'DHUI

Unsk  
operators able  
to perform tests  
Are estimated  
at  
approximately  
500 to 700 in  
the territory

The  
measurers  
qualified by  
QUALIBAT  
are among  
754



The syndicate today is  
representative of one  
third of the 754 qualified  
measurers Qualibat

