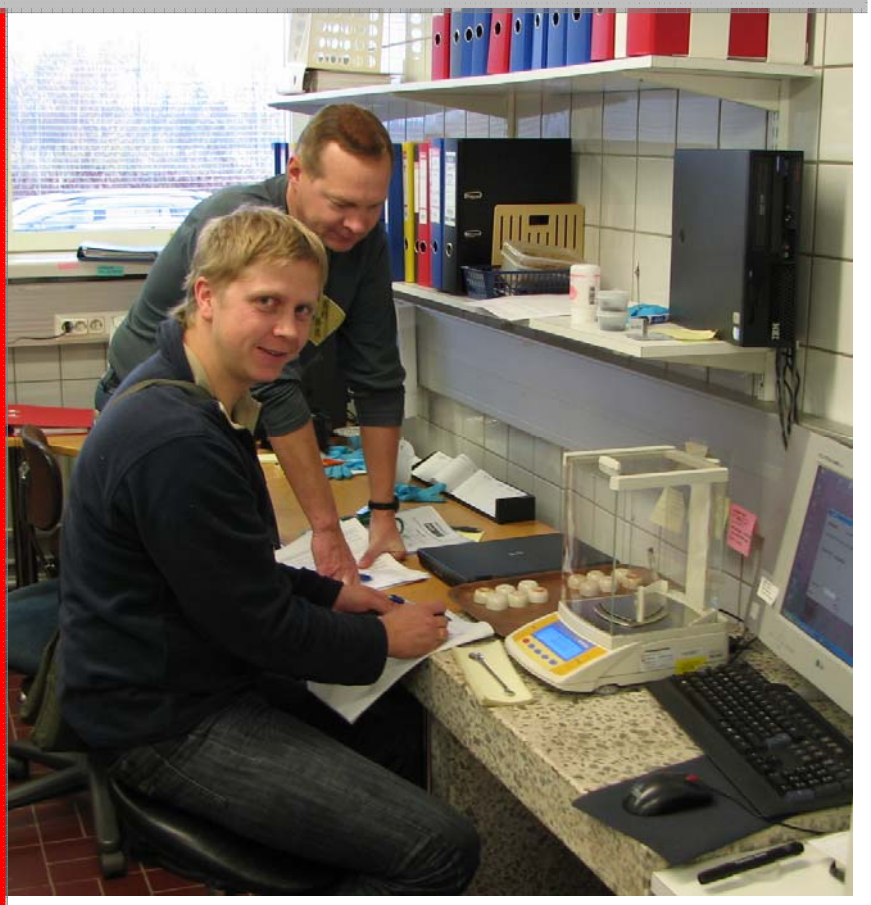
PHYDADES

Intelligent Energy Europe



PHYDADES – D13

Summary report of WP 4

Implementation of CEN solid biofuels standards in biofuel trade and fuel analysis by training and on-job work

Intelligent Energy Europe

All the results of the PHYDADES Project, are available on the following Internet site:
www.phydades.info

Intelligent Energy – Europe (IEE)

Summary report of WP 4

Implementation of CEN Solid biofuels standards in biofuel trade and fuel analysis by training and on-job work

Start date of the action: 1 January 2007

Duration: 3 years

End date of the action: 31 December 2009

WP Leader: Eija Alakangas, VTT Technical Research Centre of Finland

Cover photo: Andris Deksnis and Toivo Tomingas participating in on-job training in Finland

Project website: http://www.phydades.info

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Preface

The PHYDADES project (EIE-06-042 – PHYDADES) Phyllis Database Dissemination, Education and Standardisation is funded by Intelligent Energy Europe EU programme and carried out during 2007 to 2009.

The PHYDADES project is coordinated by ECN, the Netherlands and other partners are: VTT, Finland; SLU, Sweden; EC-BREC, Poland; TUT, Estonia ; AICIA, Spain ; ETA-Florence, Italy ; OFI, Austria ; ENAS, Finland

This is a summary report of the work package 4: Implementation of CEN Solid biofuels standards in biofuel trade and fuel analysis by training and on-job work. This work package was co-ordinated by VTT.

1 Introduction

Reliable information on biomass fuels and ashes is vital for the rapid penetration of biomass as a sustainable fuel in the European Union and beyond. Biomass producers, trader and buyers, equipment manufacturers, legislative bodies and all other parties involved in the use of biomass demand independent background information on the composition and quality of biomass fuels and biomass ashes, generated using standardized methods.

The first objective of the PHYDADES project was to create such a database (BioDat) from the existing database PHYLLIS and the multitude of data present (but not readily available) at various European organisations.

The second objective of the PHYDADES project was to provide education in the use of standardized analysis methods, in particular for the new member states. The education consisted of on-job training for laboratory staff, training material and workshops for anyone involved in biomass trade and use.

This report summarizes the results of the WP4 - Implementation of CEN Solid biofuels standards in biofuel trade and fuel analysis by training and on-job work. The work package 4 included the following tasks:

- development of training material of CEN 335 Solid biofuels standards
- organising workshops for market actors of CEN standards and their implementation in biomass fuel production, trade and use
- organising on-job training of fuel analysis methods for laboratory staff

2 Training material

The training material was made in set of slides of different topics (see Table 1). Training material has been updated several times during the project based on the changes in CEN standards. Especially fuel specification and classes standards (multipart standard EN 14961) have gone several changes of threshold values during the project durarion. Material has been tested in several events in Finland especially in training of university students.

Co-operation has been done with FP6 research project BioNormII (www.bionorm2.eu) to produce the material e.g. in physical and mechanical properties and chemical analysis.

Table 1. List of produced training material.

Name of material	Authors	Languages
Introduction to CEN standards	Eija Alakangas, VTT	English, Finnish, Spanish, Polish, Estonian, Swedish, German
Fuel specification and classes	Eija Alakangas, VTT	English, Finnish, Spanish, Polish, Estonian, Swedish, German
Biomass fuel properties and comparison to fossil fuels	Eija Alakangas, VTT	English, Finnish, Spanish, Polish, Estonian, Swedish, German
Sampling and sample preparation	Jan Burvall (SLU), Antero Moilanen, Eija Alakangas, Camilla Wiik, VTT	English, Finnish, Spanish, Polish, Estonian, Swedish, German
Chemical analysis	Fritz Bakker, ECN Martin Englisch, ofi	English, Finnish, Spanish, Polish, Estonian, Swedish, German
Physical and mechanical properties	Hans Hartman, TFZ Markku Herranen, ENAS, Eija Alakangas, VTT	English, Finnish, Spanish, Polish, Estonian, Swedish, German

VTT provided a special slide template for training material. Training material was published first time in January 2008 in CDROM (see cover page Fig. 1) in English. CDROMs have been used to distribute the material to e.g for events and some universities.

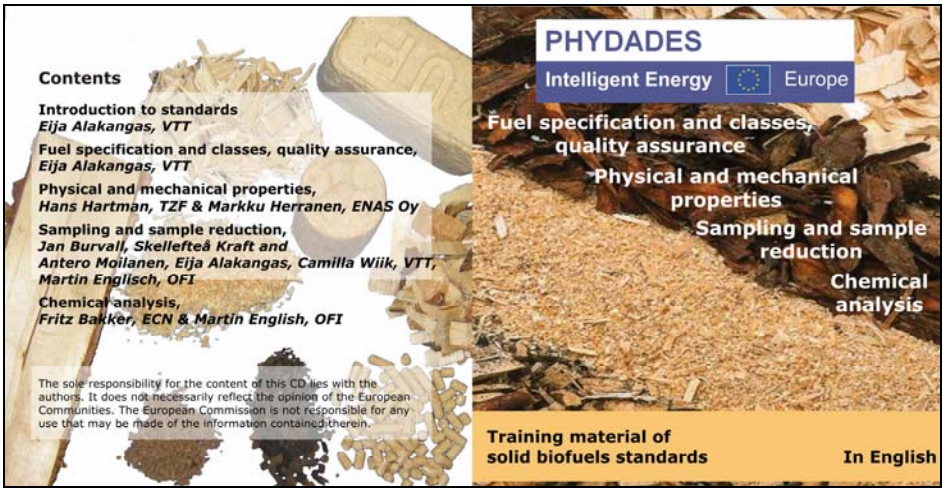

Figure 1. Cover page of CDROM for training material.

3 Workshops

The organization of four public Workshops has been a very important phase of the PHYDADES Action. These events have been organized in New Member States, in order to stimulate the biomass market, the interest of main actors and create a diffuse knowledge on solid biofuels analysis methods.

Speakers of the event were members of the consortium, CEN standardization experts and local experts. The presentations covered topics as fuel specification and classes, quality assurance, sampling and most important standards for analysing physical properties e.g. moisture content, particle size distribution, ash content, and mechanical durability of pellets. Several examples of the real solid biofuel end-users from industry (heating plants, power stations, pellet producers) have been presented. Also the use of the new BIODAT database has been advised to the participants.

Target group were companies and other organisations, which need information on fuel properties to specify their products such as solid biofuel traders, producers, energy companies using biomass fuels and authorities.

The basic structure of the programme was proposed by VTT and ETA have produces common layout for workshop programme. Local organiser has invited speakers and distribute to their contacts. ETA has distributed the event flyers of Estonian and Romanian workshop to large number of contacts. ECBREC and AICIA have carried out the planning of the programme, invitations and flyers for events were held by local languages.

One day workshops were organized in Estonia on 24 April 2008, in Poland on 15 October 2008, in Romania on 20 November 2008 and in Spain on 21 November 2008. Events in Estonia and Romania were international and presentations were held in English in Estonia and Romania, because events are targeted also to neighbouring countries. Events in Poland and Spain were held in local language. In total 175 participants attended the workshops and 75 of them were from industry (43%).

Table 2. Summary of the organised workshops

Place	**Tallinn, Estonia**	**Warsaw, Poland**	**Seville, Spain**	**Bucharest, Romania**
Date	24 April 2008	15 October 2008	21 November 2008	27 November 2008
Organiser	TUT	EC-BREC/IPiEO	AICIA	ETA-Florence
Participants, total	50	36	40	49
-industrial	25	18	12	20 (estimate)
PHYDADES speakers	VTT, SLU, ECN	ECN, VTT, OFI	ECN	VTT, OFI, ENAS Oy, ECN

Also feedback from participants was collected during the workshops by questionnaire. The general feedback was very positive. From 50% to 70% of responses find events excellent and useful. In the first workshop in Tallinn some participants found presentations of analysis methods and sampling too theoretical. Presentations were improved for the further seminars. Participants found especially useful presentations from industries, which have applied standards in their business. The project group decided to produce also training material of the standardisation process, because this was not known for most of the participants. The importance of new CEN/TC 335 standards and fuel quality was highlighted in the workshops.

Tallinn workshop delivered information about biofuel classes, properties, standards was new for most participants and it was thankfully accepted. Workshop informed biofuel related companies about available reliable information and local consultancy sources - PHYDADES home page, Biodat database and TTU in Estonia. During passed 18 months the main biofuel producers/dealers in Estonia have upgraded production process and product quality control based on relevant CEN standards handled on workshop.

The participants in Poland (over half of them represented industry sector) put emphasis on the necessity of work on biomass standardization, noticed that the workshop is a good chance to learn about it and agreed that the workshop should

be recommended to others. According to the participants the most interesting issues were biomass standardization and databases including BIODAT, however, other topics were found also interesting. The workshop allowed to identify what new information should be included in the BIODAT database. As the most important of them were 'caloric value with dependence on moisture content', 'estimation of transport influence on biomass', 'ash melting temperature', 'as much as possible kinds of biomass', 'info on biomass straw originated'.

Figure 2. Workshop material in Spain.

Several key points were discussed during the presentations in Spain. Some of them are the following:

- How to guarantee the quality of the biomass and the impact of this on the final biomass cost.
- Prices of equipments for various of the key analysis such as the heating value and moisture,
- Rapid methods for controlling by analysis some key parameters during the biomass reception in industrial installations
- The problem of the transportation of the biomass and the change of quality during the delivery
- The differences between the planned and actual deadline for the upgrading of TS to EN standard for solid biofuels.
- The certification of laboratories with the new solid biofuels standards
- A variety of technical details of some of the standards, specially those related with physical, chemical properties and also on sampling preparation
- How to include the ash properties in the database

More information on workshops:

1. Teet Palve & Jüri Loosaar, Tallinn workshop report, 6 p.
2. Alberto Gómez Barea & Susanna Nilsson, Seville workshop report, 9 p.
3. Marzena Hunder, Polish workshop on use of standardized methods for solid biofuels properties measurements 7p.
4. Filippo Vivarelli, Romania workshop report, 12 p.

4 On-job training

In the Baltic States (new member states) there is not organised public training of laboratory staff. The Baltic States are trading huge amounts of solid biofuels to the markets without proper analysis of fuel properties. New CEN fuel specification and classes (prEN 14961), and quality assurance standards (prEN 15234) will require analysis of the properties by standardised methods, which currently are not used in the Baltic States and in Southern/Eastern Europe.

On-job training was carried out in Austria, Finland, Sweden and Spain. The main idea was to learn by doing the actual work in a laboratory. Each country organised on-job training for 2-3 persons in 1 – 2 weeks periods, of which at least one week is spent in their laboratory facilities. The total number of trainees were 8 (target was 5 to 10).

The selection of trainees was done by the host organisations. Trainees have sent applications with CVs to VTT (21 applications received) or they have also contacted host organisations directly. The main criteria for selecting trainees were the following:

- laboratory technician training
- capable to speak English or language/s of host organisation
- at least one year experience in laboratory work

On-job trainees was selected primarily from companies working in biomass markets, e.g. private laboratories or quality control laboratories doing analysis for fuel producers and buyers**.** Project partners collected contacts of different fuel laboratories in May 2008. The focus was on countries where there is the greatest need for this kind of training, for example in Baltic countries and other new member states.

The project group produced slides based on CEN standards in different languages. Slides were sent to the trainees as PDF files together with pre-work instructions. In the beginning of on-job training at the host organisation, a detailed work plan was done together with trainee and the host based on the template made by VTT. Also presentations of host organisations and analysis methods were introduced in small workshop with trainee and host organisation.

Each trainee wrote working instructions on how to analyse the most important properties of solid biofuels in their native language. These working instructions can be used afterwards in their normal work. A more detailed description of on-job training is shown in the Figure 3.

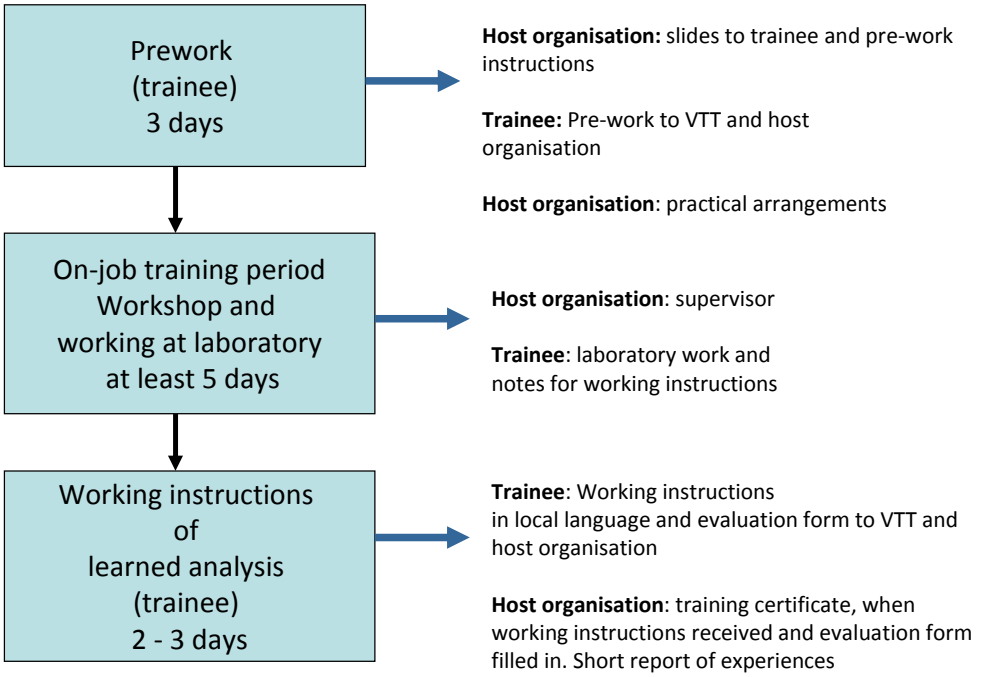

Figure 3. Organizing and duties of different parties in on-job training action.

Each trainee was also asked to fill in questionnaire after the training period. When feedback form and working instructions were made host organised gave certificates to trainees passing the laboratory work.

On-job training started in Finland in October 2008. The trainees from Estonia and Latvia participated training in Finland for two weeks period, first in Jyväskylä and then in Espoo.

All trainees were interested in on-job training and learning CEN standards. Their motivation was excellent and they were eager to ask questions. They had some laboratory experience and turned out to be practically inclined. The training was a success and the feedback was positive from all trainees. Trainees especially appreciated the contacts with professional laboratory staff and the possibility to use modern fuel analysis equipment.

The organisers found that 2 weeks is sufficient to teach basics of both physical and mechanical standardised analysis methods for solid biofuels. During training the trainees were given information about the process of CEN standardisation. By practical work and writing working instructions the use of knowledge afterwards were better. Some of the trainees organisation has also purchased new analysis equipment e.g. for pellet mechanical durability testing.

Some comments from trainees

"I have learned very much about solid biofuel CEN standards and standardization process as well. Very good was the possibility to do practical laboratory work together with professional researchers. Very essential was also to get lot of new materials (knowledge) about supplying and treating biomass and of course to visit VTT bioenergy research centres in Jyväskylä and Espoo."

Figure 4. Estonian trainee in Jyväskylä at ENAS Oy laboratory.

"We are implementing PHYDADES project training experiences in our every day activities in Estonia making sample lots for CHP plants from round wood chips, forest residues chips, bark and sawdust. We are also doing some control tests using the following instructions: determination of bulk density CEN/TS15103; moisture content CEN/TS 14744 and particle size distribution CEN/TS 15149. In the near future, we have some plans to launch a new wood pellets production related project. I am convinced that in this case we should use the following instructions as well: amount of fines of wood pellets CEN/TS 15149; mechanical durability of pellets CEN/TS 15210; ash content CEN/TS 14775."

"Everything was excellent. Especially idea to start in more commercial laboratory in Jyväskylä and finishing in research laboratory in Espoo."

" I learnt a lot of solid biofuel analyses, which I do not make in Romania. I saw and I worked with a lot of interesting apparatus and equipment and I met many professional people in Sweden"

"I learned about biofuels analysis and the standards used. At the research institute in Romania, we performed almost all analysis that I have seen in Sweden, but I learn to utilize the elemental analysis instrument. That´s is why it was a great opportunity to work with the Belab in Sweden who has a

very professional team and all the instruments required. I appreciate the availability of the trainee to enter professional, who explained very detailed the standard used for each analysis, the instruments and the method for each standard. For me it was very good to work effectively with the instruments."

Figure 5. Two Romanian on-job trainees in Sweden.

"I learned in Spain to use technical specification for the characterization of solid biofuel. The best part was the detailed explanation of these technical specification and resolution of doubts. I am very happy to be able to do this course and it is a good initiative for standardization in the field of biomass".

The two participants were well prepared for the training and completed all the tasks successfully in Spain. During the on-job training the trainees madder observations about different CEN methods and raised a few points that they thought were important for the implementation of the CEN standards for biofuels:

- Biofuel producers and consumers, in many cases don't know how the samples should be stored properly.

All the results of the PHYDADES Project, are available on the following Internet site:
www.phydades.info

- Sample preparation is very important since it is the base for a good analysis. The sample preparation involves some steps that may be influenced by the human factor.
- The method for measuring the bulk density implies that an operator should let the sample fall freely from a height of 150 mm, maybe it could be more suitable use mechanical devices to settle the sample instead. This way the influence of the operator would be eliminated.
- The calorific value is the most complicated analysis and it is affected by a number of corrections that have to be applied to the measured value, sulphur, nitrogen, moisture, etc. It is very important to point out that the moisture content should be measured just prior to the measurement of the calorific value (CEN/TS 14774-3).

5 Conclusions and lessons learnt

The preparation of CEN standards are long progress and for industries it is difficult to participate several years for development process. The CEN/TC 335 – Solid biofuels standards has been developed from year 2000 and they are finalised end of year 2009 and beginning of year 2010. The role of the PHYDADES project has been very important in dissemination the information of ongoing work on CEN standards, teaching fuel analysis methods by on-job training for the laboratory staff and providing updated material for training and other events.

Main results of the WP4

- comprehensive training material of CEN 335 standards developed
- continuous training of fuel properties and standards has started in Finland in the following universities: Technical University of Lappeenranta, Joensuu University and Jyväskylä University
- better capabilities in new member states to carry out standardised analysis of solid biofuels and improve the biomass fuel quality.

AICIA is planning to use the experience gained during the PHYDADES on-job training to implement a laboratory course for fuel analysis aimed at laboratory staff from industry, for example power plants and from universities and research institutes. VTT will continue training of fuel properties and standardisation in universities in Finland.

The experiences of on-job training were so positive and trainees have used the experience after the training period efficiently. Most of the PHYDADES project partners found important to continue on-job training also in the future. This is very important, because all CEN solid biofuel standards will be in force in 2010 and fuel purchasers are requesting continuous control of fuel by using standardized methods.

Lessons learned

- The organisers found that 2 weeks is sufficient to teach basics of both physical and mechanical standardised analysis methods for solid biofuels.
- It was important that laboratory staff from new member states could learn solid biofuel analysis by doing in professional fuel analysis laboratories and they had the possibility to work with modern laboratory equipment.
- Writing work instructions of learnt analysis methods were useful after the on-job training period.
- Presentations in workshops should be practical and include presentations of local companies utilising standards in their production and trade of solid biofuels.
- Continuous updating of the training material during the project was useful and helped companies and research organisations to follow process of solid biofuel standardisation.

Partners of PHYDADES Project

The PHYDADES partnerships are formed by institutions with a broad range of competence on biomass utilisation and analysis. The partners are comprised of 9 key players from 8 European countries. Between them a strong representative from Northern European countries (where biomass utilisation and standardisation methods are well developed) but also from Eastern/Southern European countries (where there is the need of a definition of standards for solid biofuels production and utilisation).

Role	Name	Logo
COORDINATOR/1	**ECN Energy Research Centre of the Netherlands**	
ECN is the largest research centre in the Netherlands in the field of energy. ECN develops high-level knowledge and technology for the transition to a sustainable energy system.		
COBENEFICIARY/2	**VTT Technical Research Centre of Finland**	
VTT works in research, development, testing and information services to public sector and companies as well as international organisations. VTT is the biggest contract research organisation in Northern Europe. VTT provides high-end technology solutions and innovation services. VTT has 140 biomass experts.		
COBENEFICIARY/3	**SLU Swedish University of Agricultural Sciences**	
SLU develops the understanding and sustainable use of the natural resource soil. This is achieved through education, research, environmental assessment and information Extension.		

COBENEFICIARY/4	**EC BREC/ IPiEO Institute for Fuels and Renewable Energy**	
EC BREC / IPiEO, a scientific-research unit within Institute for Fuels and Renewable Energy, dealing with all aspects of renewable energy in Poland. Its mission is to stimulate development of renewable energy sources in Poland through scientific research, development of innovative technologies, creation of relevant policies, strategies and plans, and implementing RES projects.		
COBENEFICIARY/5	**TUT Tallinn University of Technology**	
The mission of Tallinn University of Technology is to support Estonia's sustainable development through scientific creation and science-based higher education in the field of engineering, technology, natural and social sciences.		
COBENEFICIARY/6	**AICIA Association of Research and Industrial Cooperation of Andalusia**	
AICIA is an Association that works in industrial development sector, with particular attention to the diffusion of their test, to favor the advancement of technological level in Andalucia.		
COBENEFICIARY/7	**ETA-Florence Renewable Energies**	
ETA is composed by engineers, economists, environmental and communication experts. Thanks to the support of the best specialists ETA is a qualified and dynamic company able to offer global services of consultancy and project development in RE sector.		
COBENEFICIARY/8	**OFI Austrian Research Institute for Chemistry and Technology**	
OFI is one of the largest Austrian institutes for testing and research. Our customers are European companies from various economic sectors. It is accredited as a testing centre according to ISO 17025 for more than 800 testing methods in various areas.		
COBENEFICIARY/9	**ENAS Oy**	
ENAS is an independent laboratory that provides competitive and reliable energy and environmental analyses to its clients. The business idea of ENAS is to focus on the production and trade of solid indigenous fuels, laboratory services, and the new business opportunities involved in emissions trading.		

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