

KuBus 65 - Working in the Realm of the Invisible - High-tech Replaces Collieries

00'07"Original sound, Dr. Dietmar Borchert, Laboratory Head,

Fraunhofer Institute's Laboratory and Service Centre, Solare Energiesysteme

"North-Rhine Westphalia *does* call itself the 'Energy State'."

00'18"Original sound, Prof. Angelika Heinzl, Head of the

Centre for Fuel Cell Technology (ZBT), Duisburg

"If you have to wean yourself from coal and steel, you must look for new technologies, new possible sources of employment and income."

00'33"Original sound, Prof. Dr. Christof M. Niemeyer,

Chair for Biochemical Microstructure Technology,

Dortmund University

"The numerous research activities that already exist in this area show that the Ruhr region is actually already well on its way in this direction."

00'43"

A coal-mining area well on its way to a high-tech future. The Ruhr region – the heartland of the Federal State of North-Rhine Westphalia – is writing another chapter in a truly eventful history.

00'54"

Coal and steel once left a strong mark here on the character of people and landscapes, creating a unique culture.

01'01"

What remains is not much more than a backdrop.

01'10"

The age of industry was an era of gigantic dimensions:

Above ground: Mountain ranges of steel, machines as big as houses.

01'20"

Below ground: A network of shafts and tunnels covering hundreds of kilometres.

01'26"

Those who lived here saw, smelled and felt the Ruhr region round the clock. And that wasn't always very pleasant.

01'35"

Today, air and water are once again relatively clean and clear.

01'40"

The people too, who no longer live with rust, dust and the dangers of working underground, have also changed.

01'48"

Randolf Walter personifies the transformation that the Ruhr region has undergone.

01'55"

A former coal miner, he now works in the cleanest environment imaginable.

02'03"Original sound, Randolf Walter

"Working in the 'clean room' is something completely different. The name says it all: It's clean, so you don't get dirty anymore."

02'09"(Off) Randolf Walter

"Spending your days down the mines you'd get so filthy that even your own girlfriend wouldn't recognize you at the factory gate."

02'18"

As a micro-technician Randolf Walter now works in small – very small – dimensions.

02'24"

On microscopic atomizer structures, for example. Many times finer than a strand of human hair, they allow for medication to be administered in an extremely fine spray, effective, for one thing, in the treatment of lung disease – something many coal-miners suffer from.

02'43

But down there below ground, co-workers were more than just friends.

02'48"Original sound, Randolph Walter

"You had to put your life in the hands of the others, and the same in reverse. Yes, working as a coal-miner really was something quite special."

02'57"

The so-called 'pit-gas', for example, was a constant, insidious threat:

03'03"(Off) Randolph Walter

"Pit gas is very dangerous. In certain concentrations, it can lead to firedamp explosions. If someone somewhere then hammers on iron, it causes a spark, and then you have a coal dust explosion that really no one can survive."

03'16"

What was once a deadly risk factor is now a source of energy.

For several years now power stations located directly above a former colliery have been running on pit gas, producing enough energy to meet the heating needs of an entire city district.

03'30"

High-tech is a magic word that conjures up the future.

03'34"

And: energy from regenerative sources, such as solar power.

03'39"

People here have actually always been involved with energy. But high-tech – that's something *new* – and that wants learning.

03'49"

A case in point: Gelsenkirchen, where solar technology is now produced at the highest level. And it's no coincidence that a major oil company is now occupied with the production of solar cells.

04'04"

In one of the world's most modern facilities, Shell-Solar Deutschland produces ever more efficient cells that transform sunlight into energy.

04'14"

In 1954, when the first solar cell was introduced in the US, it was only able to transform six percent of the sunlight it stored into electricity.

04'22"

Now it's already up to 15 percent, and the so-called 'wafers' are as thin as two pieces of paper.

04'31"

Which is still not sufficient to compete as a viable replacement for fossil fuel sources.

04'40"

Original sound, Sjouke Zijlstra, Manager – Shell Solar, Deutschland

"Currently a great effort is being made to make thinner wafers."

04'44"(Off)

Sjouke Zijlstra, Manager – Shell Solar Deutschland

"One advantage would be that the wafers would be cheaper. And another thing we expect is.."

04'50"

Original sound, Sjouke Zijlstra, Manager – Shell Solar

Deutschland

...that the cells would then become more effective."

04'56"

Constantly raising efficiency levels is one of the goals for the future. "Smaller, Thinner, Lighter" is the researcher's motto.

North-Rhine Westphalia is now host to the densest network of energy research groups in Europe. Just under a hundred universities and research facilities are devoting their resources to this field.

05'19"

Also located in Gelsenkirchen is the laboratory and service centre of the Fraunhofer Institute, Solare Energiesysteme.

05'32"

The researcher's latest product is markedly thinner and more efficient than the cells produced in the factory next door:

05'40"

20% percent output: That's a world record!

And the functional layer is a barely-still-measurable 5-to10 nanometres thin.

05'53"

A nanometre is a billion times smaller than a metre. That's the equivalent ratio that our planet has to a hazelnut.

06'07"

This Federal State is using development on the very smallest incremental level to equip itself for the global energy market of the future.

06'14"

The concept and development is also aimed especially at countries that have better weather conditions than Gelsenkirchen, but where energy supplies nonetheless remain insufficient.

06'25"

Original sound, Dr. Dietmar Borchert, Laboratory Head,

Fraunhofer Institute's Laboratory and Service Centre,

Solare Energiesysteme

"In sunny regions we always have a higher irradiation potential. In such places we can naturally achieve more output with this sort of solar installation.

In future that will play an increasingly larger role, because solar energy is a decentralized energy technology, in other words, you can produce your energy right there where you need it."

06'43"

To achieve this, solar energy, too, makes use of nanotechnology: The technology that makes the smallest material structures not only visible, but useful as well.

06'55"

The manipulations possible within the micro cosmos are becoming increasingly sophisticated, but Randolph Walter sees changes in the macro cosmos as well, and the effects they have on work and daily life.

07'07"Original sound, Randolph Walter

"In the new companies, because it is a completely different world of work, there are, of course, also friendships."

07'15"(Off) Randolph Walter

"In our firm there are a lot of group activities for the employees – we go sailing, go on outings."

07'21"Original sound, Randolph Walter

"Only, it's just a bit different."

07'24"(Off)

"Of course it's not like it used to be. In the summertime we had allotment gardens, where we also sometimes got together."

07'33"

The emotional ties were much stronger.

07'37"

The company where Randolph Walter works is going from strength to strength. Within the last ten years the number of people employed there has risen from 40 to over 300.

Micro and nanotechnology create jobs.

07'50"

But they are jobs for highly qualified specialists. This field will never employ anything like the number of people that the coal and steel industry once did.

08'00"

And the whole point is to achieve a precision in the smallest dimensions that human hands on their own can no longer deliver.

08'10"Off Randolph Walter

"There's a microchip made of synthetics."

08'14"

We also call it lab-on-a-chip, that is ...

08'18"Off Randolph Walter

"..we're trying to produce laboratories the size of a chip card."

08'22"

Which means that: On this chip, 96 biochemical reactions can be examined at one time.

08'29"

That not only makes an entire laboratory redundant, but the people who work there as well.

08'35"

And it's meant to get even smaller.

08'38"

At Dortmund University one of the most renowned scientists for biochemical nanotechnology teaches and researches. Professor Niemeyer is also involved in the development of lab-on-a-chip systems.

08'51"

This requires measuring instruments, the tips of which consist of a single atom, and which are used to make DNA and protein molecules visible.

09'05"Original sound, Prof. Dr. Christof M. Niemeyer,

Chair for Biochemical Microstructure Technology,

Dortmund University

"The reduction to miniature size enables you to obtain a very precise analytical result from a much smaller amount of a test substance.

That is, you need much less tissue, for example, so that ideally you'd be able to use just a single cell, and you could then determine if this

cell is effected by a specific disease representing, for example, the focus for the development of a tumour.

These are the sorts of possibilities that using the analytical techniques we have today, are completely inconceivable. And this is where new perspectives are being developed.

09'42"

So the hope for a better future lies in unseen realms. But what's invisible doesn't generate many symbols or centres on which people can orient themselves.

09'51"Original sound, Randolph Walter

"Once you've been a miner, it's really quite difficult to take part in this new structural transformation in the Ruhr region."

09'59"(Off)

"It wasn't just work that you went to in the morning and came home from in the afternoon. You're entire life revolved around the pits. There were always people to talk to. You only had to step outside and someone would come running into your open arms with all their problems. Now that's not the case."

10'16"

At the Centre for Fuel cell Technology in Duisburg, scientists are researching what is one of the great hopes of the energy sector.

10'22"

Energy is generated within a fuel cell by a chemical reaction with hydrogen. And the only waste product of the process is steam!

10'35"

Early results are encouraging: A company in Gelsenkirchen, for example, has produced a prototype of a bicycle powered by fuel cell. The innovative bicycle motor takes over from about 50% of human muscle power.

10'50"

But only when aided by nanotechnology is it possible to perfect the constituent parts of the fuel cell,.

11'00"

The Duisburg researchers are working flat out on this.

11'06"Original sound,

Prof. Angelika Heinzl, Head of the Centre for Fuel Cell Technology (ZBT), Duisburg

"First of all, that would give us access to a very clean energy transformation technology in this country.

And of course we would also have the opportunity to generate new products for export to other countries.

At the moment, it is a fact that within Europe, North-Rhine Westphalia, and especially Germany as a whole, is very far ahead in the field of fuel cell technology."

11'33"(Off)

Prof. Angelika Heinzl, Head of the Centre for Fuel Cell Technology (ZBT), Duisburg

"A nano-fuel cell does not yet exist. But we use nanotechnology whenever we need catalysers.

This is of very special importance in the electrochemical transformation within the fuel cell, because very expensive platinum catalysers are used for this – precious metal, which, in the form of nano-particles is mounted on a carrier, to insure that this expensive precious metal is used sparingly.

The membrane is coated with these catalysers – you may have seen this in the laboratory – it is black, and this black is the catalyser.

Those are many, many nano-particles. Many tiny nano-particles are attached to a larger hydrogen particle, and they then act as catalysers.

12'17"

Prof. Angelika Heinzl, Head of the Centre for

Fuel Cell Technology (ZBT), Duisburg

"We've long since used technologies that we as individuals don't actually understand. It's been a long, long time since you could be satisfied with simple things such as fire to cook with. We have mobile phones and cars, and I don't know anyone who knows exactly, in detail, what's going on in their mobile or car.

And it's the same with nanotechnology, with all of the high-tech developments: We no longer understand them, but we use them just the same.

But I don't believe that that's a problem for humankind, because new technologies are mostly fun as well."

12'50"

Still the transformation is clearly not just pure pleasure. But turning the clock back to the old days is not an option.

Something Randolph Walter also accepts.

13'00"Original sound, Randolph Walter

"Then I'd be one of those people hindering progress. For the greater goal, for progress, you have to let things go. But there is definitely also a sense of melancholy."

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