



PAUL WURTH

Advanced Technologies
for Tomorrow's Challenges



Latin American Iron & Steel Congress
Cancún, October 27th, 2008

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Ladies & Gentlemen:

My name is Marc Solvi, I am CEO of the Paul Wurth Company with headquarters in Luxembourg.

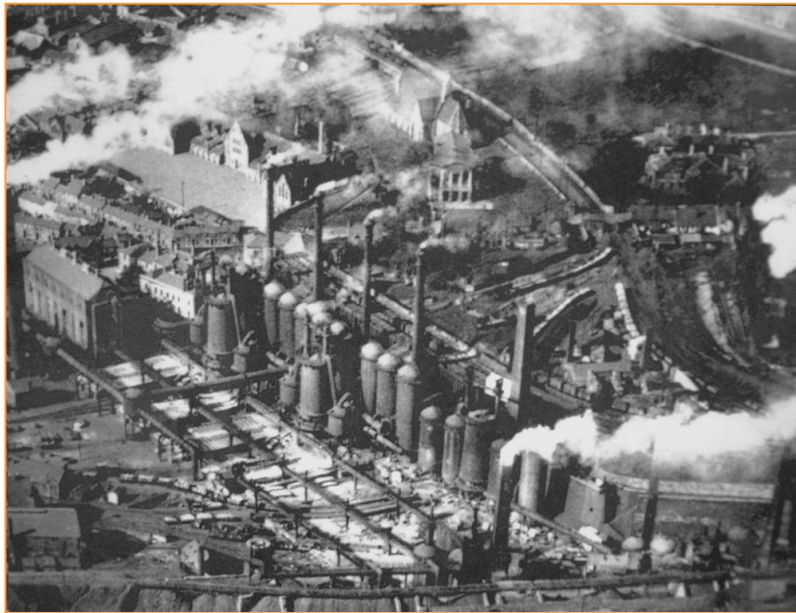
First of all, I would like to thank ILAFA and the organization committee of this conference for the honour and opportunity to address to the present audience.

We have been asked to describe our views on specific environmental matters related to Paul Wurth's business and to the industry we serve.

I will cast spotlights on certain technologies which shall help to discuss the aspects related to these matters. And, as a conclusion, we would like to highlight **WHY** we think to be prepared for the challenges of the future.

You all probably know that the activities related to blast furnace ironmaking are by far the strongest pillar of our company's business. From an historical point of view, this is no surprise: Just before World War One broke out, there were more than 50 blast furnaces running in the region of Luxembourg.

Here and today, blast furnace technologies and our common environment will be the subject of my further discussion.

BLAST FURNACE PLANT – HISTORY & ENVIRONMENT (1)


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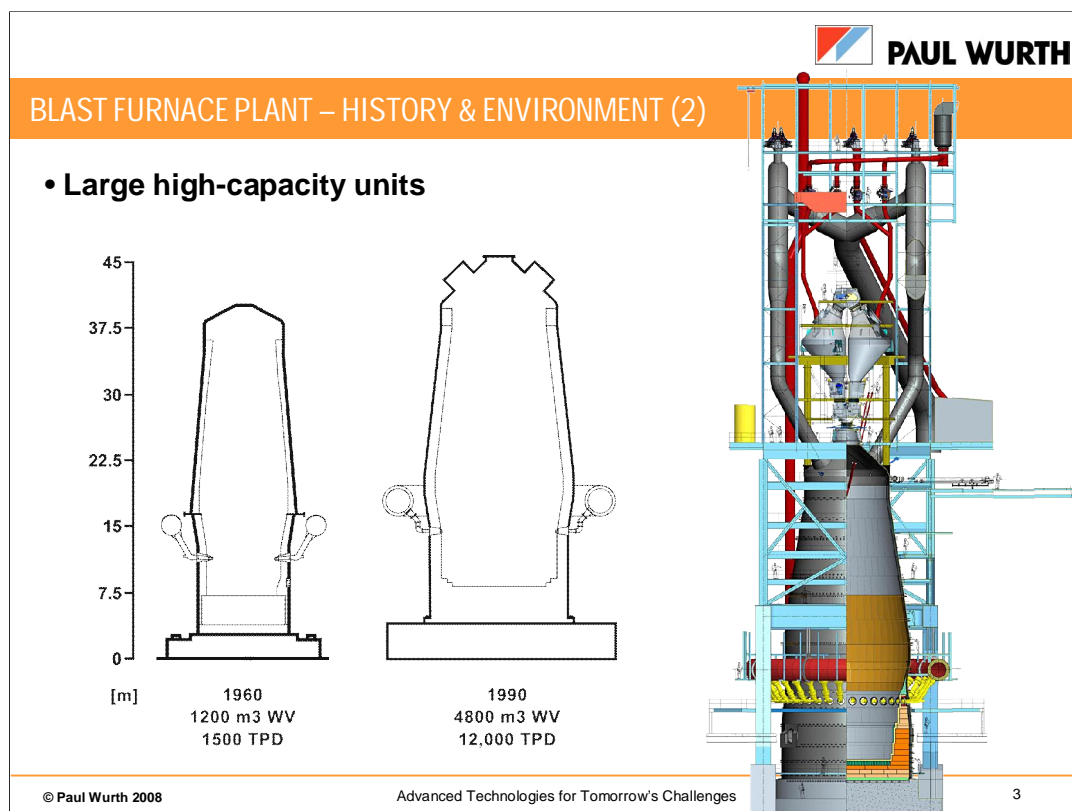
It is just a few decades ago – and many of us grew up with these impressions – when blast furnaces, for what reason ever, became an allegory for the crisis of the whole industry.

They have been pictured as smoky, noisy monsters – symbols of wasting energy and of pollution. At the same time, very much hope was put onto new iron- and steelmaking routes; some people would even have expected that blast furnaces would disappear completely.

Today, we see two facts:

- any of the **significant** capacity increases of the past few years, especially in the emerging countries, comes nearly exclusively via the blast furnace route.
- When market cycles forced steelmakers to cut capacities and to close blast furnaces, the remaining units got modernized, improved, made fit for capacity, flexibility, energy efficiency and lifetime.

Let's have a look at this development and the relevant technological features!



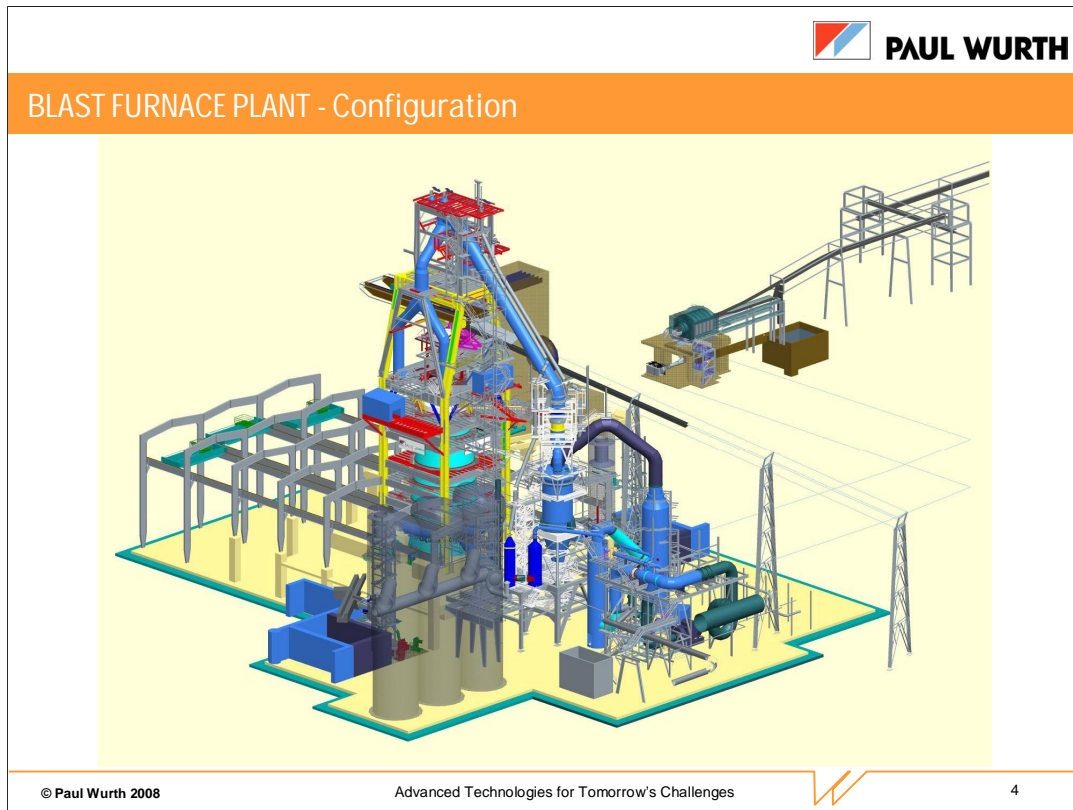
Operation at higher top pressure brought a jump in productivity.

Larger and larger hearth diameters and furnace volumes resulted in significantly **higher capacity per unit** and higher yield.

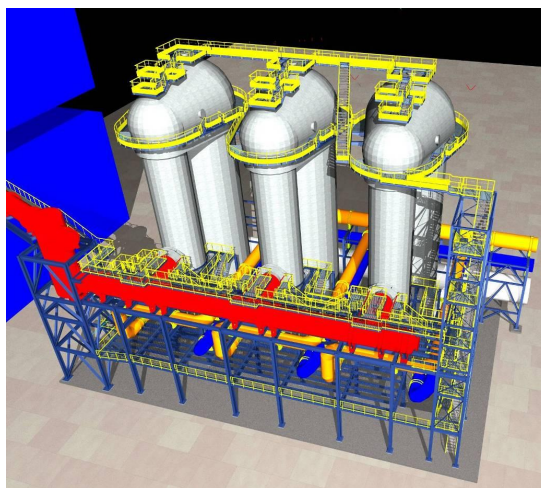
Newly developed and revolutionary improved equipment helped to make the pace: The bell-less top charging system and its flexible burdening patterns gave greatly extended means of process control. New cooling and lining concepts became possible thanks to great development in material and design of cooling members and refractories; resulting in multiplied furnace campaign duration.

Compared to their equivalents of the 1950-ies, today's most performing blast furnaces are "only" 3 to 4 times bigger in volume but produce 8 times more hot metal per unit!

As a consequence, lower specific consumption of all process utilities but also of investment goods (like steel structure, for instance) per ton of hot metal has been reached – and less specific environmental impact.



A modern blast furnace plant with all its indispensable auxiliary equipment is a very complex system of processes; and there are many points in it where environment related technologies are being applied.

BLAST FURNACE PLANT TECHNOLOGY – Energy Efficiency
Hot blast stoves plants with waste gas heat recovery


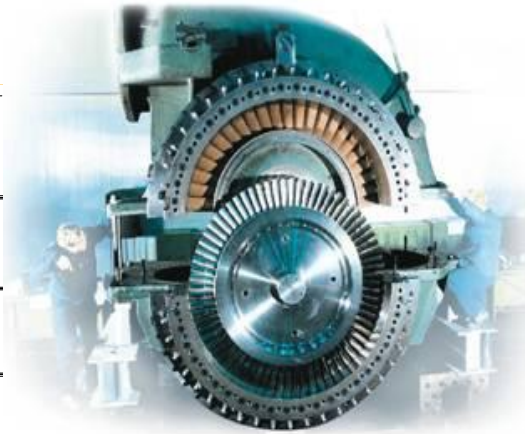
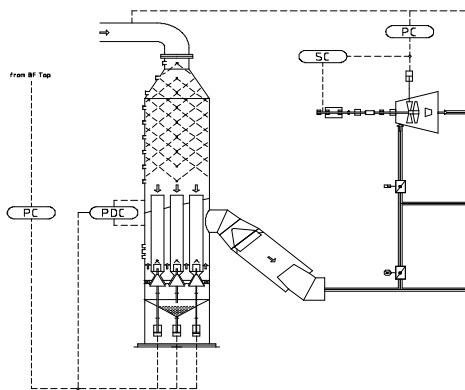
- **Energy savings**
- **CO₂ emission reduction**

Great progress has been reached in terms of **energy efficiency**:

The hot blast for the furnaces is generated in the stoves where several hundreds thousands of cubic meters of air per hour have to be heated from ambient temperature up to 1300 °C. The **heat recovery technology** uses at best the heat of the combustion products, namely for the preheating of fuel and combustion air.

This enables a more complete combustion and results in significant fuel savings. One example: A plant of 4 blast furnaces in Taiwan uses this technology and saves the equivalent of more than 17,000 litres of oil per hour.

Calculated in mid-2007 prices, these savings sum up to 60 million USD per year, with CO₂ emission reduced by approximately 450,000 tons per year at the same time.

BLAST FURNACE PLANT TECHNOLOGY – Energy Efficiency
Blast furnace top gas energy recovery


- Energy savings
- CO₂ emission reduction

Similar success can be reached by the use of **top gas recovery turbines**.

After the blast furnace gas has been purified in a modern gas cleaning sub-plant with minor pressure drop, it is lead through an expansion turbine where its kinetic energy is transformed into electricity.

Further, the blast furnace gas, with its remaining calorific value, is used for other energetic purposes outside and inside the ironmaking plant.

For a blast furnace with high top pressure, the energy recovered ***just by using the turbine(!)*** can reach 160 million kWh per year, summing up to savings in electric energy of 8-16 million euros.

The corresponding reduction of CO₂ emission is 160,000 tons per year.

BLAST FURNACE PLANT TECHNOLOGY – Pollution Control

**Blast furnace top gas cleaning;
De-dusting technology &
effective filtering systems**



- **Dust & sludge recycling**
- **Emission reduction**

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Blast furnace **top gas cleaning** is an industrial standard.

Modern plants for this purpose are multiple-step systems with high separation efficiency, scrubbing down the dust content from 12 grams to under 5 milligrams per cubic meter.

They even allowing to sort the extracted dust into different types for an effective re-use.

The more critical item in terms of **dust** are the uncontrolled emissions.

In an ironmaking plant, they can reach 5 to 15 grams per ton of hot metal produced.

The identification of every significant dust source, followed by **effective aspiration** and optimum **filtering techniques** can reduce overall dust load to the order of 1 to 15 mg/Nm³.

BLAST FURNACE PLANT TECHNOLOGY – Pollution Control
Slag granulation and dewatering technology


- Emission reduction
- Resources savings




Slag granulation is one of the big success stories of the past few decades, also from the environmental point of view.

A modern blast furnace produces 250-300 kg of slag per ton hot metal.

The state-of-the-art cold water granulation with steam condensation releases less than 5 g of sulphur per ton of slag, compared to 1000 g, if the slag would be dumped into open pits.


Furthermore, this modern granulation technique, combined with effective dynamic drum dewatering, provides for a highly vitrified product, the slag sand, which enjoys excellent demand from the cement industry replacing there the valuable natural raw material clinker.


In fact we can say that, as far as the slag is concerned, the blast furnace process has become a truly **zero waste** production!

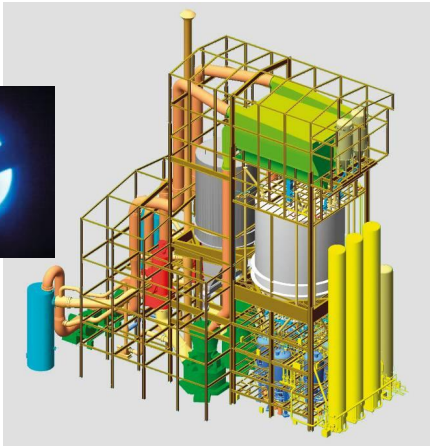

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BLAST FURNACE PLANT TECHNOLOGY – Resources Efficiency

Injection of pulverized coal for process intensification and coke replacement







- **Efficient use of coal resources**
- **CO₂ emission reduction**

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Another sound example for the efficient use of resources is the **injection of pulverized coal** as an additional reducing agent into the blast furnace.

The cost difference between PCI coal and the replaced amount of expensive metallurgical coke justifies the technology economically, even if the cost of blast furnace ironmaking is considered alone.

Furthermore, a PCI rate of 180 kgs per ton hot metal is said to reduce the energy need of the blast furnace process by 3.6%.

The PCI technology becomes by far more attractive, if the complete chain of coal supply and transformation is taken into account.

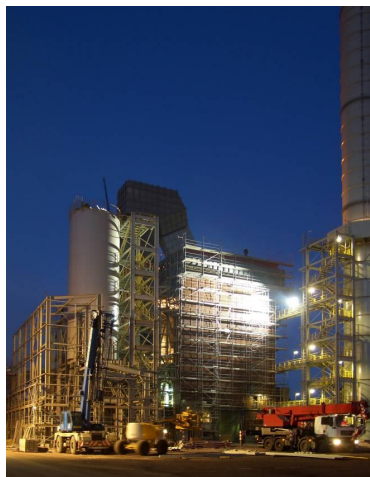
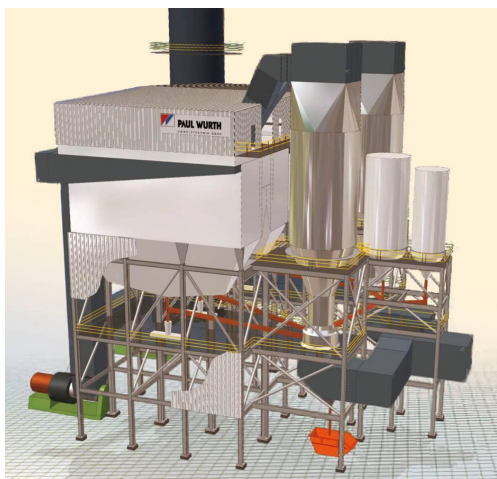
The PCI coal is cheaper than coking coal, and its conversion into injectable powder costs 3 times less than the production of coke.

Capital spending on coke oven plants can be limited to the extend necessary for matching the needs in non-replaceable coke.

The degree of pollution, production of critical by-products and emission of CO₂ can be reduced (or avoided) accordingly.

If using PCI, the overall potential in coke replacement can be thumb-ruled at 100-250 kg out of some 500-550 kg needed for an all-coke operation of a blast furnace.

This reduces tremendously the global amount of CO₂ generated by the integrated steelmaking route.

SINTER PLANT TECHNOLOGY – Pollution Control
Dry off-gas cleaning system with complex removal of contaminants


- **Pollution control**
- **emission reduction**

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The last example for the integrated route is related to **sinter plant**, a domain into which we successfully entered thanks to our experience and competence in solving environmental problems.

The technology is called Dry Gas Cleaning for Sinter Plants and represents a complex, additional stage of sinter strand waste gas treatment which follows the classical primary dedusting of this gas.

The process is performed in a so-called Entrained Flow Absorber; additives and a very small amount of water help to clean the gas of sulphurous and nitrogenous oxides, hydrochloric and hydrofluoric acids as well as of furans.

Final bag filtering ensures an additional dust reduction for the off-gas.

The first installation is operative at ROGESA in the German State of Saar since spring 2006, matching the stringent conditions of the German (*“TA Luft”*) environmental legislation.

DIRECT REDUCTION PROCESSES for Recycling Purposes
PRIMUS Process
(multiple hearth furnace based)

**ArcelorMittal Woierer By-Products
 Recycling S.A., Differdange, Luxembourg**
RedIron / RedSmelt Process
(rotary hearth furnace based)

RedIron Plant at Lucchini SpA, Piombino, Italy

From all my presentation so far you may feel a preference for the blast furnace ironmaking route. And, subsequently, you may ask: So, why does Paul Wurth also engage in direct reduction then?

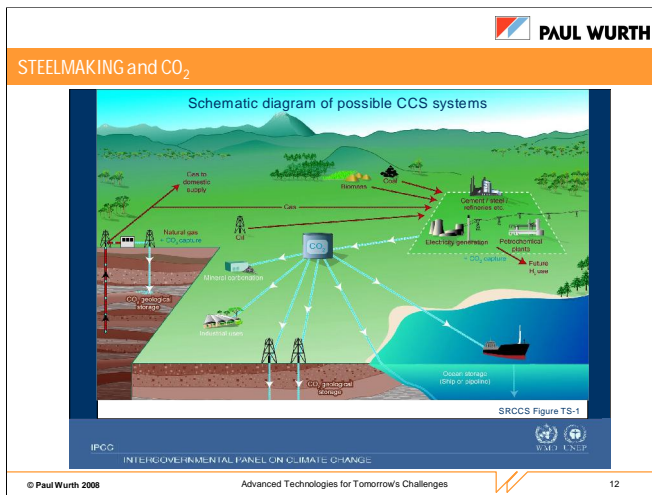
Yes, based on our experience in layout and design, on our knowledge of customers' operational constraints, we are deeply convinced that, when it comes to producing more than 1 million tons per year of hot metal by unit, the blast furnace is still the smartest solution, thanks to its flexibility and to proven technology.

And: Yes, indeed we continue to work in direct reduction processes – and there is no contradiction to my statements before.

Both of our **new iron reducing technologies** are dedicated to recycle steelmaking residues. Neither of them has ever been considered to be a means for hot metal capacity increase.

In Luxembourg, ArcelorMittal operates a by-products recycling facility, which uses the PRIMUS technology for the commercial production of pig iron, slag and zinc oxide out of metal containing steelmaking residues.

The point is: The Luxembourg steel industry is 100% EAF based and produces almost 3 million tons of crude steel a year. The corresponding amount of critical ferrous dust and sludge is 60,000 tons. It is exactly this amount which is completely recycled by this plant, thus practically transforming the country's steelmaking into a zero waste production process!



We can not keep silent here about **global warming**.

We serve an industry which will remain in the focus of this debate.

Steelmakers burn a lot of carbon in order to “just” win steel – not energy!

We do better to be amongst the driving forces of this debate, and in doing something about it as well.

In the European Union, we – steel producers and plantmakers – have joined, for several years already, in the “ultra-low CO₂ steel making” research project (*ULCOS*). The problem is identified; there is good progress in developing ideas for certain solutions.

One fact we see is that only combinations of several individual measures will result in effective reduction of emissions to the atmosphere.

And we learn that capture and sequestration of CO₂ is considered to be a part of the solution – making up the lion’s part of the effect.

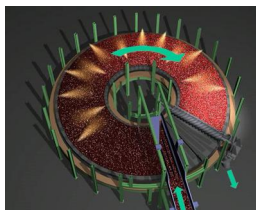
We do not want to cast general doubt on the findings of reputed scientists of our own branch, but it should be allowed to ask ourselves questions:

What happens when the idea of CO₂ sequestration into earth cavities, onto sea ground becomes subject to a much broader public discussion? Could that turn into a discussion as about nuclear waste?

Apart from the technical solutions, there are certainly other aspects:

- How will the general consumption behaviour of mankind develop?
- What will be the economic situation in the different, directly concerned parts of the World?
- And: How much time is left to us to react?

IRONMAKING and ECOLOGY



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With regard to **technology** we can say:

- **here** is the blast furnace,

- **here** is the rotary hearth furnace,

- **here** is Primus – proven solutions, feasible processes, being in operation and under constant development.

In the broader context, all these developments seem to be quite small steps; but that are logical, realistic steps, with respect to economy and to emissions.

And so, they are also a result of our continuous commitment to the environment.



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READY FOR TOMORROW'S CHALLENGES ?

- ▶ **Environmental commitment**
- ▶ **Technical competence**
- ▶ **Professional competence**
- ▶ **Social competence & commitment**

- ▶ **Fair Competition**
- ▶ **Intellectual Property Protection**

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Now, are we ready for the challenges of tomorrow?

We all find ourselves moved to a liberalized, global and highly competitive world market. I truly believe that all the leaders of the European plantmaking business are good prepared for remaining important players:

We *live* the **environmental commitment with the technologies** described just before;

We have **technical competence**: we do not just build a plant – we understand what the client is going to do with it;

There is **professional competence**: I mean international presence, global operation, global sourcing, the ability to consider customer's constraints in a complex view of investment, project realisation and further operation of a plant – thus being a competent knowledge partner in the process of evaluating the total cost of ownership;

And –we maintain **social competence and commitment**, for instance in terms of putting health and safety on top of the priorities: in design, in construction site management, in all activities.

I think that we did and do our homework for strengthening such advantages. The mentioned competences will stay the our best arguments in competition and towards our customers.

You can imagine that these strengths are the result of hard work of more than one generation of devoted engineers. One shall know that, with all respect for all competition, we are prepared to defend our positions, be it, for instance, by claiming for **fair trade** or by protecting **intellectual property rights**.



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IEWS & VALUES

- **Research & Development**
- **Health & Safety**
- **Qualification & Knowledge Transfer**
- **Social & Environmental Responsibility**

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Ladies and Gentlemen:

In 2007 and all the years before, we at Paul Wurth spent a significant part of our earnings on **R&D**. We will continue to invent, continue to develop at such a high level as now – mainly in order to improve performance and the value-for-money ratio of our products, and with respect to the environmental challenges.

Health & Safety of our collaborators, of clients' staff and all people surrounding us are key values. Our efforts in this direction have led to a high level of sensitisation of our people for these matters. I am proud that – today – our engineers act as “ambassadors of safety” in designing and commissioning, on all construction sites where we are active.

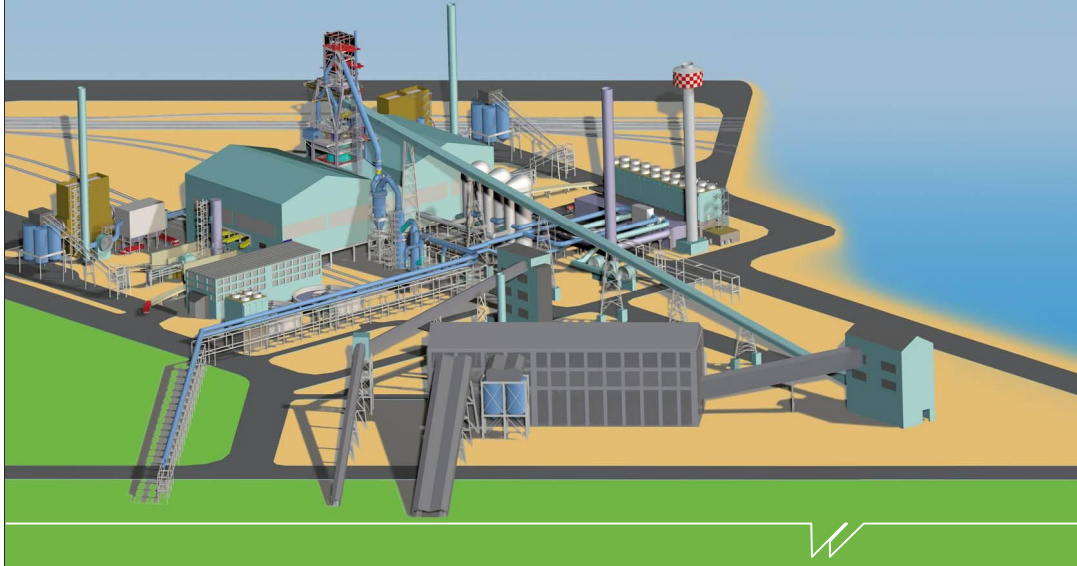
The current tremendous workload makes us hiring people. We are organizing a much **accelerated and efficient in-house transfer of know-how** and professional experience. Live-long learning is becoming a necessity – and opportunity – for people of all ages.

Today's presentation tried to highlight the **environmental aspects** of our business. Our industry will remain in the heart of this debate, but also amongst the driving forces for a change. At our offices and construction sites, avoiding the production of CO₂ will become a design criteria and a behaviour pattern.

I believe that **it is the combination of these values** with professionalism, with flexibility and international operation which makes our business – as well as our clients' industry – **excellent and strong enough for facing the coming challenges**.

ILAFA-49, Cancún, MEXICO – 2008

Thank you for your attention!



Thank you all for your kind attention!