

Celebrations in Ganzhou

- 100 Years after the First Discovery of Tungsten in China



Courtesy of Ganzhou Tungsten Industry Association.



Courtesy of Claude Lanners.

Tungsten REACH Consortium

Successfully up and running, the first meetings of the Consortium were held on 6 December 2007, at which time membership included 24 companies (see the list of members on our website).

Negotiations are continuing with the China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters (CCCME) regarding their membership on behalf of the Chinese companies which have been awarded tungsten export quotas in 2008.

The Consortium Secretariat's principal efforts in 2008 will be assisting members to pre-register; setting priorities for an extensive research programme of laboratory tests to generate the necessary data to conduct risk assessments on the substances covered by the Consortium Agreement; and organising Lead Registrants.

Led by the President, the ITIA's delegation to this momentous anniversary was received during 7 to 9 November with great courtesy and entertained with generosity by leaders in Jiangxi province and the City of Ganzhou. Congratulatory letters read at the Opening Ceremony began with a message from China's Premier, Mr Wen Jiabao, and subsequent presentations included "A Family's Day with Tungsten" (by Dr Zeiler - and an article in this Newsletter) and "100 Years of Tungsten Technology" (by Prof Schubert).

Gifts were exchanged between ITIA and the City of Ganzhou and the 6kg Globe of Tungsten alloy from the Xihuashan mine achieved fame by its appearance (together with the ITIA Secretary-General) on the most famous TV show in China - "The Same Song" which was performed specially for the occasion in the City of Ganzhou. The enthusiasm of an audience of many thousands is illustrated here!

ITIA 21st AGM, September 2008, Xiamen

Xiamen Tungsten Company has generously offered to host ITIA's 21st AGM in Xiamen and the provisional outline programme is given below:

- | | |
|---|--|
| Monday 22 September 2008 | - ITIA Committee meetings |
| Tuesday 23 September | - ITIA Committee meetings
- ITIA reception and buffet dinner in the hotel |
| Wednesday 24 September 2008 | - AGM (morning)
- REACH Consortium Committee Meeting (afternoon)
- Dinner hosted by Xiamen Tungsten |
| Thursday 25 September 2008 | - AGM (morning) |
| Mine Visit (Optional) - Xinghuokeng Tungsten Mine, Ninghua, Fujian | |
| Thursday 25 September 2008 | - Depart hotel in the afternoon and travel by bus (4 hours), and stay overnight in a local hotel.
Xiamen Tungsten informal dinner |
| Friday 26 September | - Mine visit and return by bus to Xiamen after lunch |
| Plant Visit (Optional) - Chaozhou Xianglu Tungsten Metallurgical Plant | |
| Friday 26 September 2008 | - Depart by bus from Xiamen in the morning (2 hours)
Tour tungsten metallurgical plant
Return by bus to Xiamen after lunch |

Further details will be posted to our website in late May.

20th Annual General Meeting, Madrid, 24-27 September 2007

The tungsten symposium held here in 1985 had the King of Spain as Honorary President but, not surprisingly, he did not make an appearance. On this occasion, although not in the programme, he did - by coincidence, on Tuesday evening but with another group.

After days of serious meetings, it was a relief to depart for a fun evening of wine, ham and cheese tasting, dinner (for those still hungry and thirsty) at an old Carmelite Convent in a small village (Boa Villa del Monte) on the outskirts of Madrid. The evening concluded with a flamenco show which gave the opportunity for some members to show off their other personae (see photo). Alternative careers beckon. . . .

Some delegates said that it was the best meeting ever but already it is time to look forward to the next one and plan for it too to be the best ever.



Shinichi Ogura (left) with Kumpei Kobayashi (right)

Curiously there was much the same attendance as in 1985 - 230 delegates of whom only 4 were here again (plus the same old Secretary).

For the first time in ITIA's history, the Executive Committee decided to make a presentation to a retiring member. Sadly, Shinichi Ogura (see photo) is retiring from the industry, after joining Toshiba in 1971 and leaving in 1997 to become Managing Director of Nippon Tungsten. His first contact with ITIA was at the Tokyo AGM in 1989 and he then gave a paper the following year at the 5th Tungsten Symposium in Budapest. He was elected a member of the

ITIA Executive Committee in 1995 and became the first Japanese President of ITIA in 1998 and 1999. During the latter year, he was responsible for organising the successful 8th Tungsten Symposium in Fukuoka. Mr Ogura represented not only his own company but his whole country with great skill and success. In recognition and gratitude for his energy and his support, Mr Ogura was presented with a decanter made by the world-famous crystal glassworks of Baccarat in north-east France and we offer our very best wishes to him and his family for a happy retirement.

Membership

Welcome to:

▼ **Heemskirk Consolidated Ltd**, an Australian company which, through its subsidiary Daytal Resources Spain, owns the Los Santos tungsten mine in Spain.

and also to our first new members in 2008:

▼ **Climax Molybdenum Company**, a US company, producing metal powder blends with tungsten.

▼ **Galway Resources Ltd**, a US Company, is developing Indian Springs, an open-pit project in Nevada with over 60 million lbs of Tungsten contained, and the Victorio Project located in New Mexico with 200 million lbs of both Tungsten and Molybdenum.

▼ **JSC A&IR Mining**, a Russian company, producing tungsten concentrate (scheelite), exploring on several tungsten deposits and selling APT and YTO.

Tungsten in Public Life

Under this general title, the Technical Consultancy is preparing a series of articles on the manifold applications of tungsten to alloys and tungsten compounds. The first is called "**A Family's Day with Tungsten**" and follows a family of four - father, mother, son, daughter - through the course of a day, identifying the multiple encounters each has with tungsten-containing products.

Other articles will be devoted to the respective sections (cemented carbide, steel etc).

Elections to the Executive Committee

Kumpei Kobayashi, Director of Toshiba Materials Co Ltd, and Stephen Leahy, CEO and Chairman of North American Tungsten Corp Ltd.

The ITIA website and our Tungsten Brochure are undergoing revision and restyling Watch this space.

A Family's Day with Tungsten

Presentation given at the occasion of the "Celebration of the 100th Anniversary of Chinese Tungsten Industry" in Ganzhou, Jiangxi, Nov. 2007.

Burghard Zeiler, Wolfram Bergbau- und Hütten-GmbH Nfg. KG

Wolf-Dieter Schubert and Erik Lassner, Institute of Chemical Technologies and Analytics - Vienna University of Technology



TUNGSTEN - IN OUR DAILY LIFE

Our daily life is closely connected with the element Tungsten. Modern life would not be possible in the way it is without the **unique properties of Tungsten**, as they are:

- ▼ the highest melting point of all metals (3422°C)
- ▼ a high density like Gold (19.3 g/cm³) and
- ▼ a hardness close to Diamond, as Tungsten Carbide (WC)

Although Tungsten has such outstanding properties it is curiously more or less unknown to the majority of people.

In almost all cultures world wide, telling a story about something was an appropriate means to explain otherwise complex facts, so we have decided to accompany a typical family with father, mother, daughter and son for one day to see how they run across Tungsten during their normal daily activities either directly or indirectly and frequently even without realizing it.

THE STORY ON A FAMILY'S DAY WITH TUNGSTEN

Father:

It is early morning and the father has to leave for a business trip. This trip is really important and he doesn't want to oversleep. On the other hand the alarm clock would be too loud and awake his wife and he knows that she has an appointment at the hospital and is already nervous and needs to sleep well. So he adjusted the vibration alert of his mobile phone and put it under the pillow.

▼ Now he is awakened by the gentle vibration of a small Tungsten part rotated by an electric micro motor inside his handy phone (**Fig.1**).

▼ So early in the morning it is good to have this old styled 15W

incandescent lamp on his bedside table. The warm and gentle colour of the Tungsten Filament in the lamp makes it easy to get up.

▼ In the bathroom he needs of course a more intense light, to shave closely for the business trip (it isn't weekend, when he sometimes doesn't shave at all). A set of Halogen spots with high performance Tungsten wires supply the needed light.

▼ Dressed up, he passes quietly the rooms of the kids where an energy saving lamp - with electrodes made from Tungsten - has burnt the whole night. The little daughter is still so chicken-hearted, he thinks to himself (**Fig.2**).



Fig.1: Mobile phone with dismantled vibration alert; the vibrations are caused through a small unbalanced-mass motor made of tungsten heavy metal. The high density of this alloy (up to 18.5 g/cm³) renders an excellent size to vibration power ratio.



Fig.2: Energy saving lamp in the kids' room; tungsten is used in the form of wire, coils, coiled coils or electrodes in most of the modern lamp systems; power ratings are from a few watts to several thousand watts (lighthouse lamps: up to 10 kW).



Fig.3: Window heating system in the car;

tungsten wires are used for car lighting but also for window heating; tungsten wires are also used for charged (corona) wires in laser printers or copying machines; thicker wires are used as evaporation coils for the metallizing industries.

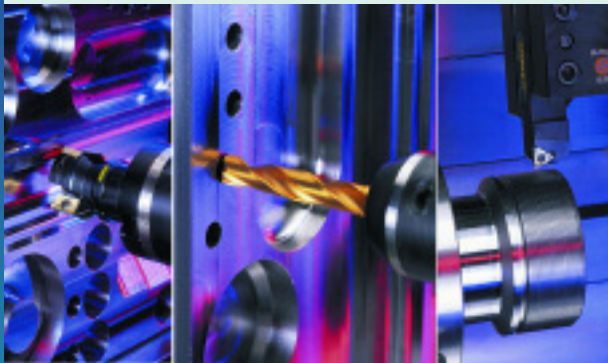


Fig.4: Cemented carbide tools are used for the machining the engine block of a car;

they use the high hardness of the tungsten carbide (WC) and constitute today more than 60% of the worldwide tungsten demand; by courtesy of Waller AG, Germany.



Fig.5: Vibration damping measures in cars;

Compact and space-saving design becomes possible by using high-density tungsten heavy metal as crankshaft balance weights; by courtesy of Plansee, Austria and Volkswagen, Germany.



Fig.6: Blowing the horn of a car;

tungsten runs across us in everyday life when strong currents are switched; the best known example is the car horn; however, safety switches also contain tungsten; by courtesy of Bayerische Metallwerke GmbH, Germany.

▼ He enters his car. It is an icy morning and he is happy to have Tungsten filaments in the front and rear windows. Quickly the ice on the windows is removed and he is grateful for the unobstructed view (**Fig.3**).

▼ When he starts the motor, he remembers what a business partner has mentioned, that so called cemented carbide tools for machining the engine block are very good business and use a strange element called Tungsten as their main constituent (**Fig.4**). Perhaps he will look for stocks of such a tool company to invest his savings.

▼ The motor is a diesel engine, but one could barely feel that. He is really happy about his new 10cylinder engine - almost no vibrations. What he is not aware of is that almost 10kg of Tungsten heavy metal parts, located around the crankshaft are responsible for the perfect vibration damping (**Fig.5**).

▼ He leaves the side street and enters the motor way. Another driver nearly collides with him, he blows the horn and the other car brakes hard. (It is early in the morning, some others obviously still sleep even on the road.) The horn is really loud and a lot of electric current is flowing. Such a horn needs special contacts to be switched - they are made of pure Tungsten (**Fig.6**).

▼ When driving on the motor way he is happy to have this self darkening mirror to avoid being dazzled by the cars behind him. A thin layer of Tungsten bronze on the glass is responsible for the darkening.

▼ He had almost reached the airport when there was a traffic jam. He got up early enough, so there is no danger to miss the plane. Therefore he is not too much stressed and can observe the road construction, which is reduced to two lanes and which is the reason for the jam. Huge road planning machines remove a certain layer from the deformed and partly broken road surface. The cut off material leaves the machine via conveyor belt and is loaded to a truck for recycling. Cemented carbide chisels made from Tungsten Carbide inside the machine are doing their duty (**Fig.7**).

▼ The jam is over and the traffic is flowing once again, but it is very cold and starts to snow. He is happy to have his 4-wheel drive car and remembers that his brother in law, who lives in Finland, is obliged to use tires with studs during winter time. These tire-studs

are made of cemented carbide and use the outstanding hardness and abrasion resistance of Tungsten Carbide to prevent the cars from skidding on icy roads (**Fig.8**).

▼ Now he is close to the cargo center at the airport. Several modern trucks are driving on the lane beside him. A label on these trucks indicates that they are equipped with the most modern equipment for emission reduction. DENOX catalysts reduce the nitrogen oxide concentration in the exhaust considerably and are made from a Tungsten containing ceramic (**Fig.9**).

▼ After arrival at the airport and check in, he enters the aircraft.

▼ His seat is close to the wing and he can see the turbines. The turbine blades in the high temperature zone of the engines are made of Tungsten containing superalloys.

▼ It is a brand new airplane. Energy saving considerations lead to the utilization of the most advanced materials. For the construction of the wing shell and the outer part of the cell, carbon fibre reinforced plastics were used. To cut these materials in shape, polycrystalline Diamond on Tungsten Carbide inserts are used. The main wing spar and the landing gear are made from Titanium alloys, which only can be machined by the use of the most sophisticated Cemented Carbide tools.

▼ The turbines start to howl, he is pressed into his seat and soon the plane is airborne. Looking out of the window he can see the flaps and the aileron working. Counterweights made from Tungsten heavy metal ensure that the force needed to operate the flaps stays within reasonable limits (**Fig.10**).

▼ He is tired and wants to take a nap, but the presentation for the business meeting needs to be refined. So he opens his bag and looks for the laptop. Some music from the iPod will make the burden of working less hard. All these electronic devices contain printed circuit boards. During the production cycle, these circuit boards are brought in shape by the use of Cemented Carbide routers and drilled with Cemented Carbide micro drills, sometimes not larger than 0.1 mm in diameter (**Fig.11**). These drills are operated at rpm's up to 350,000 and drill several thousand holes in the highly abrasive boards. The integrated circuit chips in these electronic devices use Tungsten as conducting plug or wire and Tungsten Silicide as gate material. Also



Fig. 7: Road construction work;

Cold milling machines, equipped with tungsten carbide road chisels, remove the damaged paving to the required thickness; the reclaimed Asphalt pavement can then be reused; by courtesy of Wirtgen GmbH, Windhagen, Germany.

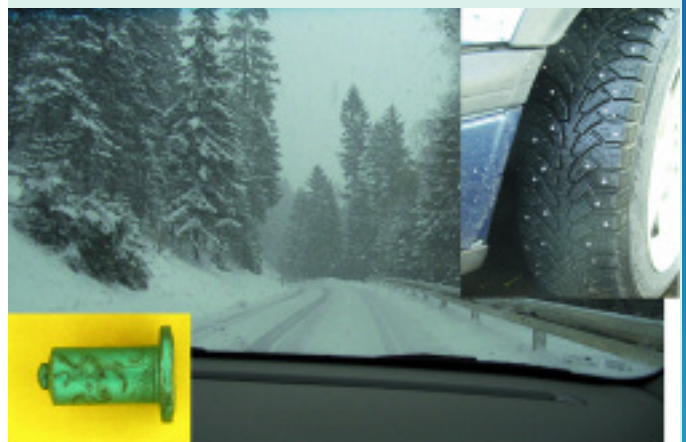


Fig.8: Hardmetal tire studs are used in the northern countries to increase safety during driving on snow and ice-covered lanes.



Fig.9: SCR-catalysts for automotive application to lower NOx-emissions;

the honey-comb-formed catalyst contains tungsten oxide and is part of the silencer system, together with a urea tank and an injection control system; by courtesy of MAN, Austria and Porzellanfabrik Frauenthal GmbH, Austria.

displays used in the equipment need Tungsten-Molybdenum alloys for production.

Finally we hope the father managed to refine his presentation and had a good and successful business day.

Mother:

After breakfast with the children, mother leaves the home by car and drives to the hospital. Today she has a CT (computer tomography) inspection of her spine, where she constantly suffers from pain. She has these pains for months and is really happy, that she was able to fix this date at the hospital as their new computer tomograph is always occupied and it is not easy to get plugged in.

▼ The computer tomography is a medical instrument which produces 3-dimensional X-ray images of the area in question. Several X-ray tubes are contained. In such an X-ray tube we find an electron gun whose electrode is made of Tungsten and furthermore a rotating anode also made of Tungsten or a Tungsten-Rhenium alloy. The shielding of the whole machine is done by Tungsten heavy metal (as a replacement for Lead, which was used in earlier days).

▼ Fortunately enough, the doctor indicated to her that nothing serious could be detected and she most probably only has to train her brace muscles to get rid of the pain.

▼ This is really good news, as immediately after the visit at the hospital, she has a date at her dentist. The last date was six months ago and therefore the first thing is to make a panorama X-ray of all teeth (**Fig.12**). Once again we find Tungsten anodes in the X-ray machine but additionally she has to wear now a protective apron, which is very heavy - "oh Lead", she says, but the dentist tells her that due to environmental reasons this apron is made of Tungsten powder dispersed in latex, which equally protects against the radiation and is eco friendly. He also tells her that at the backside of the X-ray film there is a Tungsten containing layer to protect the fingers of the patient from radiation when making the image. The film itself contains Calcium Tungstate as fluorescent to convert X-rays into visible light, which is recorded on the film.



Fig.10: Balancing flaps and aileron in modern airplanes (indicated by arrows);

the weights are made of a tungsten heavy metal alloy; up to 850 kg of counterweights are used in a Boeing 747; source: wikipedia.org/.

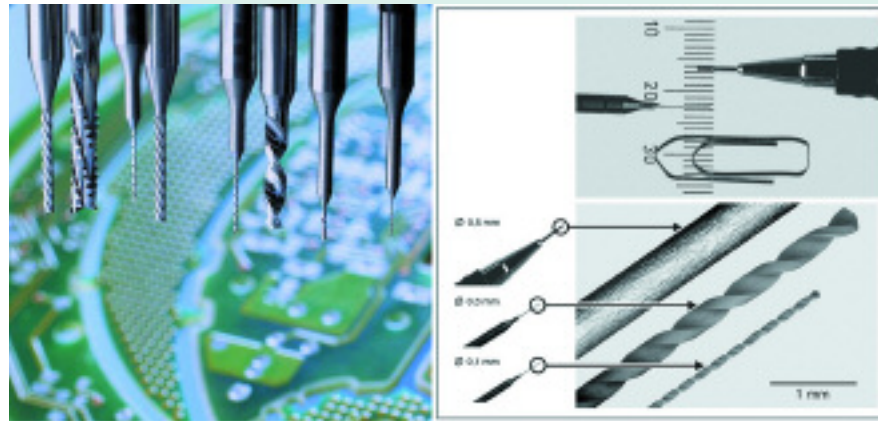


Fig.11: Carbide tools for PCB (printed circuit board) machining (left) and the latest generation of microdrills in comparison to a paper clip and a lead refill;

by courtesy of Kennametal WIDIA, Germany.



Fig.12: Making of a panorama X-ray at the dentist;

Tungsten anodes are used in the x-ray machine; modern aprons are filled with tungsten powder; calcium tungstate is still used as fluorescent material in x-ray films; source: Sirona Dental GmbH, Austria.

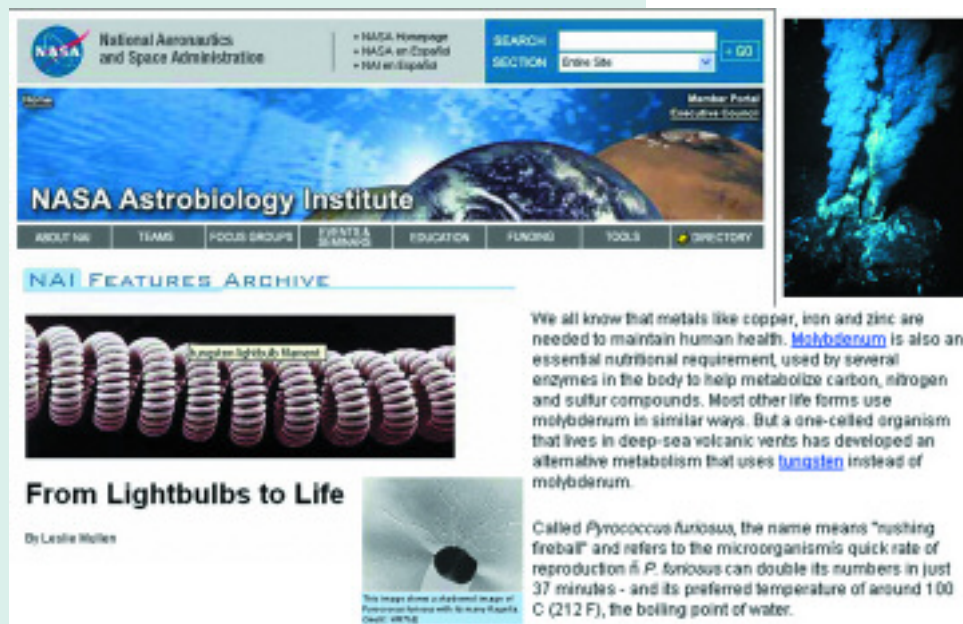


Fig.13: Scientific article on the generation of early life - and tungsten takes a leading part:
http://nai.nasa.gov/news_stories/news_detail.cfm?ID=38



Fig.14: Root canal treatment at the dentist
 Tungsten carbide is the main constituent in cemented carbides used for dental drilling;
 by courtesy of Hager & Meisinger GmbH, Germany.



Fig.15: Playing golf - relax; using High-Tec;
 High-tec golf clubs (drivers) and balls contain parts of tungsten to improve stability and performance.

After the X-ray she has to wait some time in the waiting room, where she finds some scientific journals. The dentist is obviously very interested in science and wants to give his patients a chance to read about the newest research while waiting for their treatment. Curiously enough she finds an article about the role of Tungsten in the generation of early life (**Fig.13**). According to this article it can be assumed that

Tungsten plays an important role in enzymes necessary for bacteria having lived near submarine volcanic vents at elevated temperatures. Later on in evolution, the Tungsten was substituted by Molybdenum. Today we only can find Tungsten as an essential element in anaerobic bacteria. This seems to be a left-over from ancient times, because the aforementioned cells also lived under the exclusion of Oxygen.

Still reading and contemplating how mysterious nature is, she hears her name. She sits in the dentist's chair and the dentist explains that some drilling will be required as a root canal treatment is necessary. A set of new drills is used by the dentist, most of them made from fine grained extremely sharp edged Cemented Carbide. Less friction is less heat and less pain for the patient (**Fig.14**).

After the drilling work, a Tungstate containing material is used in the fillings of the roots in order to inspect the proper filling afterwards. The Tungsten makes the filling visible on the X-ray image.

Mother is happy that all the medical stuff is finished and she is happy that the weather became much better and she can meet with friends on the golf course.

She started to play golf only two years ago, but her handicap is already as low as 18 and, she is better than her husband although he started much earlier, but due to his professional career cannot spend so much time on the course. Moreover she is very happy with her new driver, which has given her a clear push in performance. This driver has some screws for fine tuning. They are made from Tungsten heavy alloy and give the extra drive (**Fig.15**). Last birthday her

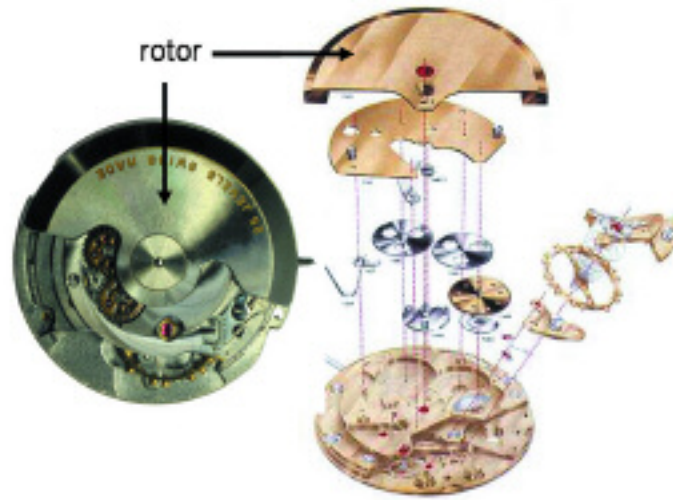


Fig.16: Watch-making using advanced materials; watchcase and strap made of scratch-free cemented carbide (left); tungsten heavy metal rotor used in automatic watches (right); source: ETA SA Manufacture Horlogère Suisse.



Fig.17: TAURUS electric locomotive; www.oebb.at. Tungsten-copper arcing contacts are used for high performance switches with switching currents up to 100 kA; courtesy of PLANSEE, Austria.

husband has given her special golf balls, which also contain Tungsten as a shell in the outer part inside the ball. These balls, when hit correctly, develop a fantastic spin, an advantage she won't miss any longer. On such cold days when the ground is hard, she also likes the Cemented Carbide spikes on her golf shoes.

▼ She takes a look on her watch, still time enough to enjoy golfing with her friends. This watch was a Christmas gift from her husband. He likes technics, so she got a highly scratch resistant watch made from Tungsten Carbide. It is a watch with mechanical movement and a Tungsten heavy alloy part for winding up the watch automatically (**Fig.16**).

We leave the mother at the golf course to have a look at the children.

Daughter and Son:

They both left home after breakfast and use the train to go to school.

▼ A new electric locomotive with several thousand horse power accelerates the train with ease. In the engine we find high voltage switches (**Fig.17**). Their contact zone consists of Tungsten-Copper parts, which are resistant to spark erosion. The engine gets the current from the overhead contact line, which has a special profile to withstand the high velocity at which the train is driving under the wire. For its manufacture Cemented Carbide drawing dies are used and the same is true for all the wires we find in the engine. The thin copper sheet parts of the engine and the transformers were die cut by the use of Cemented Carbide tools.

▼ Tracing back the electric current to its source, we come to a transformer station and finally to the power station. In each case we find high-performance switches made of Tungsten-Copper. In case of a caloric power plant, DENOX-catalysts clean the exhaust from Nitrogen Oxides. A similar technology as described for the modern trucks the father has seen in the morning, but on a much bigger scale. Vanadium and Tungsten Oxide on Titanium oxide is responsible for this beneficial chemical reaction (**Fig.18**).

▼ The son has to study for a test in physics and reads about the use of Tungsten in the first wall materials for nuclear fusion reactors, which might contribute to energy generation in the future (**Fig.19**).

▼ Looking out of the train's window, the children see an open pit coal mine and observe huge machines mining the coal. All the tools and the teeth of the shovels of the big baggers are made from wear resistant Cemented Carbide (**Fig.20**).

▼ The train runs through a tunnel, which has been constructed only a few years ago. The children still remember the big tunnel construction machine, which was also equipped with Cemented Carbide.

▼ Some farmers are working in the forest and have cut trees and are now using a shredder to make wood chips from the remaining limbs. This shredder looks new and most probably uses Cemented Carbide knives, which drastically reduce the energy consumption and are by far more wear resistant than steel knives.

▼ They reach their school and the son realizes that he has forgotten his pencil case. He is asking his sister for a ballpoint pen and a writing pad. Once again Tungsten is essential, as in the manufacture of paper, Tungsten coated rolls are used and Cemented Carbide knives cut the sheets of the writing pad in such an accurate way. In the ball pen Tungsten is even present in the most important part - the ball of the pen. This ball is made from Cemented Carbide (**Fig.21**). Such balls have a diameter of less than half a millimetre up to more than one millimetre. In Asia people like to write with finer lines, while in America they frequently use the big balls. Such a ball is a high precision part, with exactly the right surface roughness, to carry enough ink and to roll on the paper without sliding. It also has to be corrosion resistant to withstand the contact with the ink.

▼ After school the daughter meets her girlfriends and they are doing some exercise by jogging. Weights on their hands and legs increase the efficiency of the training. These weights are made from Tungsten, making use of its high density.

▼ The son meets his friends in a youth club and they are playing

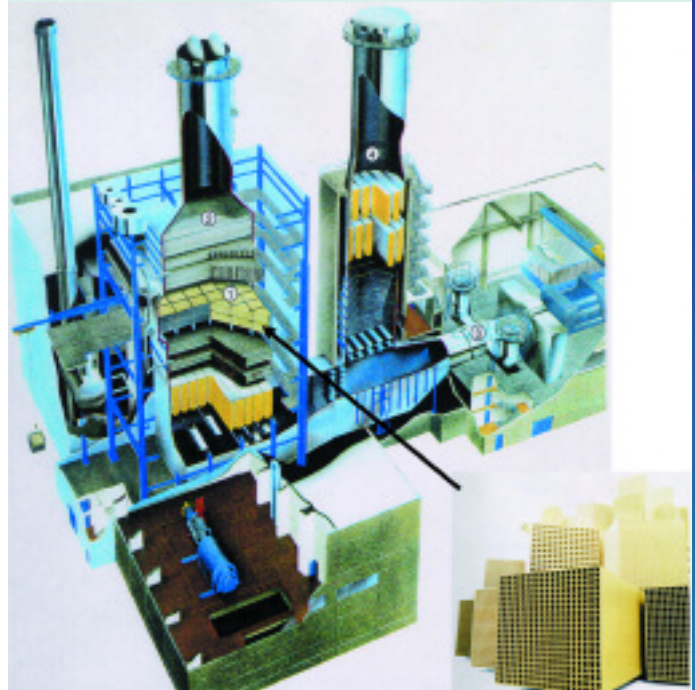


Fig.18: Electric power plant equipped with catalyst elements;

containing tungsten oxide; 1 catalyst modules, 2 waste heat recovery boiler, gas turbine, 4 bypass stock;
by courtesy of Porzellanfabrik Frauenthal GmbH, Austria

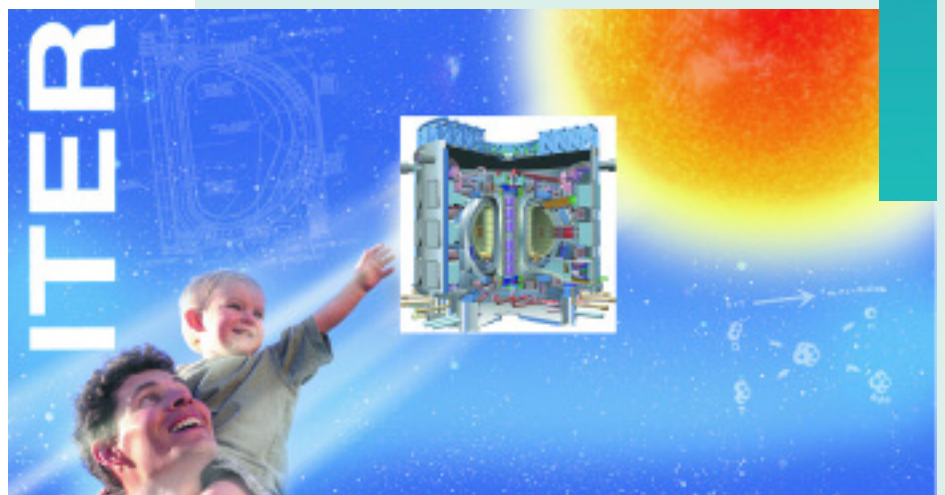


Fig.19: International Thermonuclear Experimental Reactor

ITER is an international project to make fusion technology technically feasible; tungsten is considered as the best material to withstand the operating conditions in a nuclear fusion reactor divertor; www.iter.org.

darts. Each of them is very eager to follow the example of their stars, the world champions. Therefore they are equipped with Tungsten darts. The high density allows a slim design and all three darts could be positioned into the bulls eye or triple 20 if needed (**Fig22**).

In the late afternoon the whole family meets again at home. Everyone is happy to be back. Mother tells about the good news from the spine inspection in the hospital. The father has made a successful presentation. The daughter quickly takes a shower, because she is still exhausted from the jogging exercise, while the son proudly reports about his high score in the darts club.

Together they want to use the rest of the day to work in the house.

Mother and Daughter:

▼ have bought last week new curtains for the living room. Now it is time to hang them up. Father didn't like the idea of curtains in the living room, because there is a fireplace, which they use frequently, especially during the winter months, and he feared the danger of burning curtains. But Mother and Daughter can reassure him now, that there is no danger. These new curtains are fire proof because they are impregnated with Sodium Metatungstate.

Father and Son:

▼ are working on a second bathroom. They feel, that with four family members, it is much too crowded in only one bathroom in the morning. They have selected stylish new tiles with a special glaze. The light reflecting effect of this tile was made by additions of Tungsten Oxide and Tungsten Metal to the glaze.

▼ They cut the tiles, using a Cemented Carbide cutter (**Fig.23**). After tiling, they have to drill some holes in the wall to apply the towel rack and a high board. Drilling the wall is done with Cemented Carbide tipped drills at a low rotational speed, but with ease, due to the hardness of the drill tip.

Then the **whole family** enjoys the evening



Fig.20: Open pit coal mining, using most modern equipment;
by courtesy of Sandvik Tooling.



Fig.21: Ballpoint pens are made in the magnitude of several tens of billions;
high quality pens contain balls made of cemented carbide;
by courtesy of CERATIZIT, Luxembourg.



Fig.22: Playing darts like the stars;
Professional darts are made of tungsten heavy metal
to stabilize the trajectory.



Fig.23: Working in the bath room;
WC-containing cemented carbides are used for tile cutting, hole drilling and circular knives.

▼ Mother is cooking a perfect dinner. To sharpen her knives, she uses a Cemented Carbide sharpening tool.

▼ The daughter is playing the guitar. Father immediately realized the special sound and learned that she is using special strings with Tungsten wire applications.

▼ The father is an audiophile and only recently bought an analogue vinyl record player (**Fig.24**). Mother complained because of the high price, but now she is happy to see her husband relaxing after a hard day's work, when optimizing the adjustment of the record players tone arm by fine tuning the position of the Tungsten counterweight. This Tungsten part is not only a counterweight, but is also vibration damping and thereby improving the audio quality.



Fig.24: Audiophiles prefer analogue vinyl record players;
parts of heavy metal or tungsten copper are used as counterweight and gearing block of the pick-up;
by courtesy of Scheu Analog,

▼ The son is browsing the internet, because he wants to buy some tuning parts for his remote control racing car (**Fig.25**). A set of Tungsten balls for the differential would be great. As a replacement for the original steel balls they would cause lower friction and much lower wear. Unfortunately they are out of stock. Obviously high demand for Tungsten even in the hobby sector. He tells his father, that also in full scale Formula One racing cars Tungsten parts are used to optimize the setting and achieve the highest performance on the track.



Fig.25: Tungsten Carbide differential balls are used for RC car racing.

▼ After dinner, father invites the whole family to the cinema to see an exciting thriller. It is always fascinating to see a thriller in wide angle projection with the clarity and brightness only Xenon short arc lamps equipped with Tungsten electrodes can deliver.

A long day has ended and father is happy when the time comes to relax and, perfectly satisfied, he switches off his beloved little 15W Tungsten lamp with its warm and peaceful light (**Fig.26**).



Fig.26: Sleeping perfectly after a day with Tungsten.



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