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24 May 1982

West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 9/82)

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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CONTENTS

ENERGY

PROGRESS REPORT: THYSSENGAS 'COMFLUX' PILOT PLANT

Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Mar 82 p 108

[Article: "SNG: Thyssengases 'Comflux' Pilot Plant"]

[Text] Since 1975 Thyssengas GmbH, Duisburg, has been working on the development of a process called Comflux for methanization of gases produced from coal gasification in a fluid-bed reactor. Following successful operation of the first experimental stage, a pilot facility was built and put into operation. Didier Engineering GmbH, Essen, was heavily involved in the development of the process. The installations are located on the premises of Ruhrchemie AG in Oberhausen-Holten next to a Texaco coal gasification facility which supplies the gas for methanization as needed. The pilot facility has a capacity of 2,500 m^3/h SNG. During the planned experimental period extending to 1984, important design data relating to technical optimization of equipment and processes will be developed for a large-scale demonstration installation. The Thyssen process carries out the methanization in a single reactor. Two basic features of the process make this possible:

1. The Ni catalyst used here guides two reactions simultaneously, namely methanization and conversion. Since in general the gas from coal gasification does not contain the required percentage of hydrogen for methanization, conversion of a part of the CO present in the gas with $H_2)$ to produce $H_2)$ and CO_2 is required.

2. The reaction takes place in a fluid-bed reactor which permits an especially large heat exchange during isothermic operation.

The heat of reaction can be transformed almost without loss into high-grade process steam (120 bar, 380 degrees C). Utilization of this steam makes the Comflux process about 97 percent energy efficient.

The public gas supply is standardized on natural gas with a heating value of 10 kWh/m^3. The gas generated with Comflux exhibits a heating value between 9.5 and 11 kWh/m^3. It can thus--depending on requirements--be produced in L or H quality gas.

Independent of the present competitive capability of SNG for the heating market, the development is being pursued with the following in view:

--A mature technology shall be ready for immediate service when coal gasification projects make SNG economically profitable.

--The development work shall enable Thyssengas and the German facilities construction companies to offer the world market a service-ready process: Localities with favorable coal prices and corresponding gas demand can make economical use of SNG before the FRG can.

--The fluid-bed reactor process developed by Thyssengas shall be researched relative to technological suitability for other chemical processes.

The Thyssengas development projects are being supported by the Federal Ministry for Research and Technology: the semitechnical stage at about 67 percent (costs of about DM 210 million); the pilot stage at about 60 percent (costs of about DM 50 million).

9160
CSO: 3102/231

ENERGY

BRIEFS

SOLAR POWER PLANT OPERATING--A 50-year-old French power plant concept--the generation of electricity from rising air currents produced by solar heating--is getting a new boost on Spain's Mancha high plain with German technology and financial aid. The Spanish Nanzanares updraft power plant, a pilot facility supported by the Bonn research ministry and designed by the Stuttgart engineering bureau Schlaich and Partner, is presently going into operation. It combines well known energy technologies such as wind wheel power, the green-house effect and chimney suction. An expansive plastic-foil collector canopy with a diameter of 250 m standing 8 m above the ground conducts the solar heated air into a 10-m-diameter and 200-m-tall insulated sheet metal tower. The pressure differential of the heated air in the tower produces a strong updraft which drives a turbine and connected generators in the tower. For areas bordering on deserts, Schlaich and Partner predict that, "Electricity produced from solar energy can be available soon from large-scale, low-priced facilities." Requirements for a 100-MW power plant include a tower with a diameter of 100 m and a height of 600 m plus a collector canopy with a diameter of 4.3 km. The idea stems from the Frenchman Bernard Dubos who in 1920 wanted to generate electricity on the steep slopes of the North African mountains bordering on the Sahara. A greenhouse at ground level heated by burning hot desert air was to induce a flow through an insulated riser to the mountain top at 200 km/h, driving a turbine in the process. [Text] [Hamburg Capital in German Mar 82 p 37] (COPYRIGHT: 1982 Gruner + Jahr AG & Co.] 9160

CSO: 3102/231

INDUSTRIAL TECHNOLOGY

FULLY AUTOMATIC FLEXIBLE MACHINING CENTER DEVELOPED

CNC Interconnection, Automated Machining

Duesseldorf VDI-Z in German No 3, 1982 pp 101-102

[Article: "Fully Automatic Manufacturing Cell for Machined Parts"]

[Text] I. CNC Controlled Machine Complex for Sawing, Turning and Gauging

A joint program between the sister firms Amada GmbH and Wasino GmbH, P.O. Box 17 13, D-5657 Haan 1, which involved linking various machines resulted in the robot supported system shown in Figure 1. All required processes for center working, from uncut bar stock to the finished turned part, can be carried out automatically in a single cycle with the new production unit.

The flexible machining system consists of the following elements:

--A HA-250 automatic band saw, a production saw with the following features: cutting diameters up to 250 mm; automatic height adjustment; fast material feed; patented feed-pressure regulator and hydraulic pull-in gripper with hydraulic centering unit. The start button initiates a complete cam-controlled cycle including centering, squaring and clamping, Figure 2.

--Two high-performance lathes of types L4-J and L5-J with the following features: integrated gauging system; revolving disc with 12 tool stations; length between centers, 800 mm; machinable length between centers, 635 mm; swing over bed, 580 mm; machinable diameter, 260 mm; turning speed, 10 to 3500 rpm. The automatic two-stage reduction gear is program controlled.

--A Fanuc 6-axis, CNC path controlled robots serves as a connecting link between the individual system components and assumes all loading and unloading functions.

An interface unit coordinates the execution of all commands between the saw and robot, CNC lathe and robot, robot and gauging station and gauging station and CNC lathe. Final inspection is accomplished by an external, independent measuring unit.

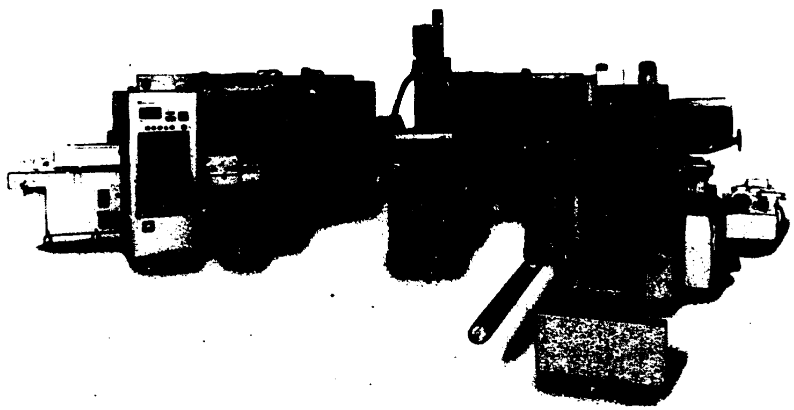

Figure 1. Automatic flexible machining system for center working consisting of a HA-250 band saw with a hydraulic centering unit, a Fanuc industrial robot and two high-performance model L4-J and L5-J lathes.

Figure 2. View of the work space of the band saw with hydraulic centering unit for centering, squaring and clamping.

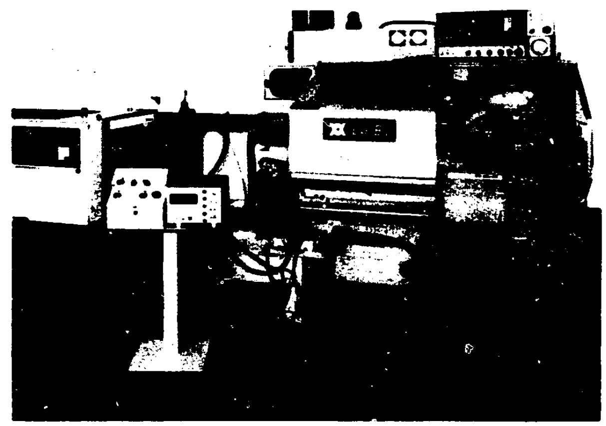

Figure 3. Automatic, flexible model LG-81 lathe with attached Fanuc industrial robot and external gauging system and sorting unit.

The individual phases of the overall operation are precisely synchronized to eliminate idle time. A signal from the interface to the saw starts a cycle. After the end cut is made, the established length to be cut is automatically advanced; the material is rotated and centered by the centering unit and then cut by the saw. All steps are executed in dialog with the interface unit. At the start of a new cycle, the robot takes the material from the saw and positions it in the first lathe. The next several steps proceed with continuous communication between the robot and the lathe: removal of the machined part from the lathe; insertion of the new material stock and start of machining. If this sequence is prevented at the first lathe, the robot goes to the second lathe and executes the same sequence of steps: The robot removes the finished piece, reloads the machine and moves the finished part to final inspection according to program. The part is gauged with respect to contour (see also section 2); and if it passes, it is placed on the parts delivery conveyor. If it does not pass, the piece is laid aside and the system is shut down. The system triggers an optical and an acoustical alarm.

During the turning operation, the material feed system (band saw and centering unit) has prepared another part. The overall work cycle involving the individual system components is repeated with no idle time. In order to eliminate scrap, the individual turning operations in the machine are monitored by measuring sensors. Dimensional deviations are automatically compensated via the correction memory of the particular lathe. The tool-break monitor is an additional safety device which helps to ensure smooth production flow without human operators. The combination of tool condition monitoring and automatic error compensation provides a high degree of quality assurance.

II. Automated Machining of Bar Stock With Path Related Tool-Break Monitoring

With the robot-supported Wasino LG 81 lathe system, Figure 3, the work flow from bar stock to the finished part is highly systemized. Preparation and machining times are significantly shortened and production control is greatly simplified. The flexible system makes possible complex machining involving boring, milling and turning. For the problem of reverse machining, Wasino offers the following solution. After the bar stock has been automatically advanced and machined from the front with appropriate tools, a gripper spindel which is synchronized with the chuck rotates the part end for end and machining continues to the butt end.

The LG 81 lathe specially designed for machining small parts is offered with standard or collet chucking. The maximum machinable bar-stock dimensions are a diameter of 42 mm and a length of 120 mm. In general, the machine is designed for chuck work up to 120 mm x 120 mm. It is equipped with a horizontal tool carrier slide (linear revolver) which provides for a maximum of 4 milling or boring tools among the total tool complement. A special technical feature is the heat-removing oil bath which prevents expansion of the axes by maintaining constant thermal conditions during the entire machining operation. The result is uniform accuracy with high surface quality. The minimal slide movements required for tool changing eliminate dwells. This is a criterion of overriding importance in machining small parts. Attached to the lathe are a bar feed and a CNC controlled Fanuc robot which functions as a mechanical arm. Added to this is an external gauging system which controls all deviations from a prescribed value.

The sorting unit of the LG 81 system employs 4 selection criteria: good, plus tolerance, minus tolerance and unacceptable. The interface unit coordinates all information exchange between the gauging station and the robot. All reports from the gauging station are transmitted to the robot and the machine control, enabling the lathe to correct to zero all values which lie below the programmed target values. This leads to a tighter tolerance band.

The LG 81 flexible machining system is equipped with a special tool-break monitor which automatically displays any deviation from a prescribed value. Before production machining, a sample part is test machined under optimal cutting conditions. During this operation, lathe motor power is recorded and plotted, and a characteristic envelope is drawn which provides a power-limit curve for the production runs. If the envelope is exceeded, the machine stops and a fault address is immediately displayed on the CRT which instantly pinpoints the cause of failure. The special advantage of this tool-break monitoring method is precise control of the entire machining process down to the lowest power levels. This differs from the usual case wherein monitoring is on certain peak values; here the machining process is controlled in all phases.

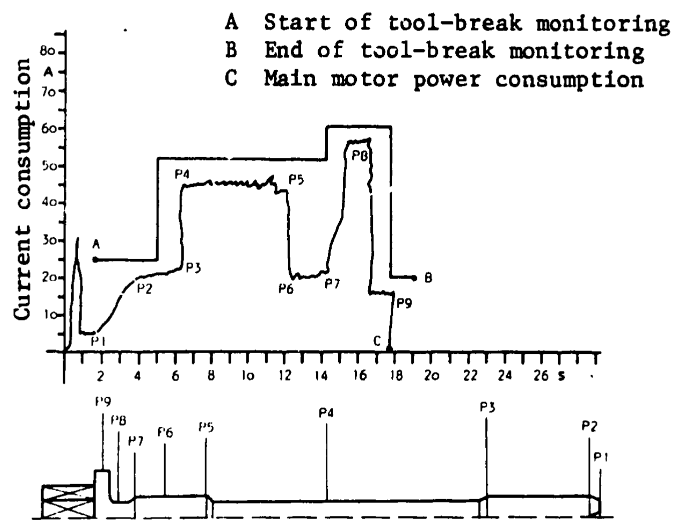

Figure 4. Path related tool-break monitoring. Power as a function of time is determined while machining a sample part and an envelope of this curve is used as the expected value for tool-break monitoring.

(Article prepared using manufacturer's data)

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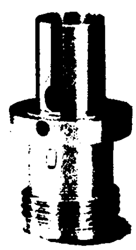
Wasino Machinery, Parts Illustrations

Duesseldorf VDI-Z in German No 3, 1982 pp A1, A2

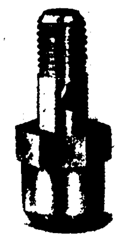
[The following are examples of Wasino products. Note that the format of all captions is the same. The first line is machining time; the second is material and the third is diameter x length. For nonround parts, such as hexagonal, diameter is measured across opposite flats.]

[Text]

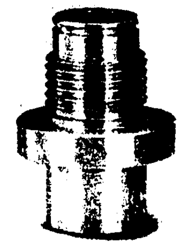


Material C45
Ø 22 mm x 35 mm

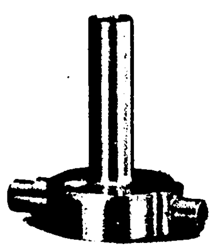
Fertigungszeit 83,3 Sek.
Material Alu
Ø 55 mm x 25 mm



Fertigungszeit 59 Sek.
Material C45
Ø 13 mm x 34 mm

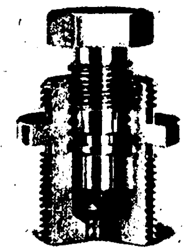


Material C60
Ø 30 mm x 35 mm

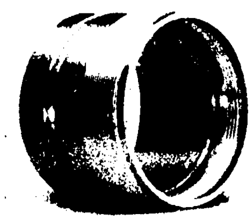


Material Stahlguß
Länge 35 mm

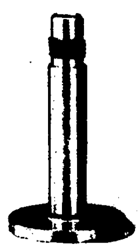
Material C45
Ø 30 mm x 52 mm



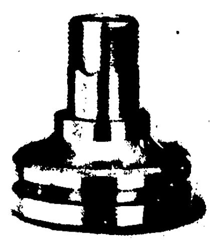
Fertigungszeit 94 Sek./59 Sek.
Material C45
Ø 22 x 20 mm / Ø 13 x 20 mm



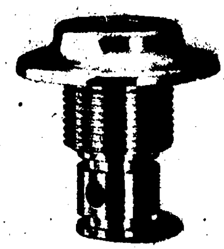
Material Alu
Ø 35 mm x 28 mm



Sek.
Material C45
Ø 28 mm x 50 mm

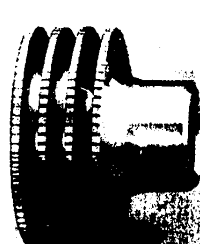


Fertigungszeit 220 Sek.
Schmiedestahl, DIN 2345
Ø 38 mm x 40 mm



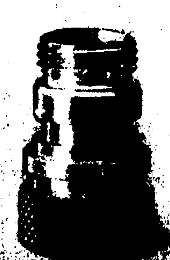
Fertigungszeit 184 Sek.
Material Alu
Ø 48 mm x 48 mm

Fertigungszeit
Material C45
Ø 35 mm x 48 mm

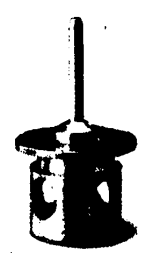


Fertigungszeit 60 Sek.
Material C45
Ø 25 mm x 22 mm

Fertigungszeit 78 Sek.
Material C35
Ø 11 mm x 20 mm



Material C45
Ø 16 mm x 30 mm



Fertigungszeit
Material Alu
Ø 17 mm x 30 mm

. USE ONLY

Key:

Row 1:

96 seconds C45 22 mm x 35 mm	83.3 seconds Alu 55 mm x 25 mm	69 seconds C45 13 mm x 34 mm	122 seconds C60 30 mm x 35 mm

Row 2:

113 seconds cast steel length 35 mm	92 seconds C45 30 mm x 52 mm	94 sec/69 sec C45 22x20 mm/13x20 mm	53 seconds Alu 35 mm x 28 mm

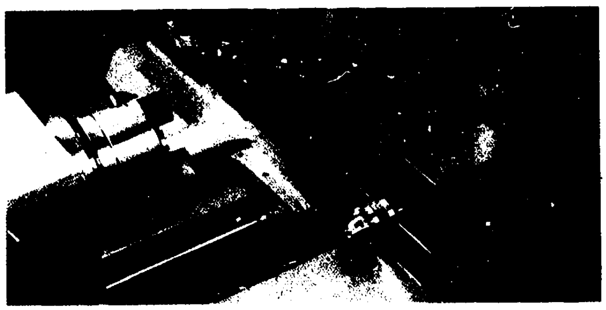
Row 3:

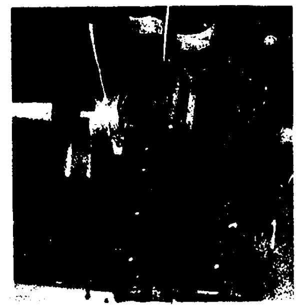
87 seconds C34 28 mm x 50 mm	220 seconds DIN 2345 steel 38 mm x 40 mm	184 seconds Alu 48 mm x 48 mm	132 seconds C45 35 mm x 48 mm

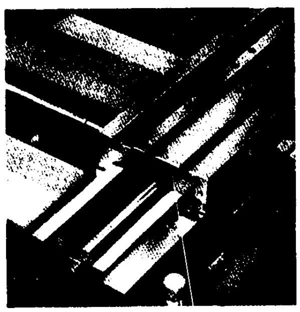
Row 4:

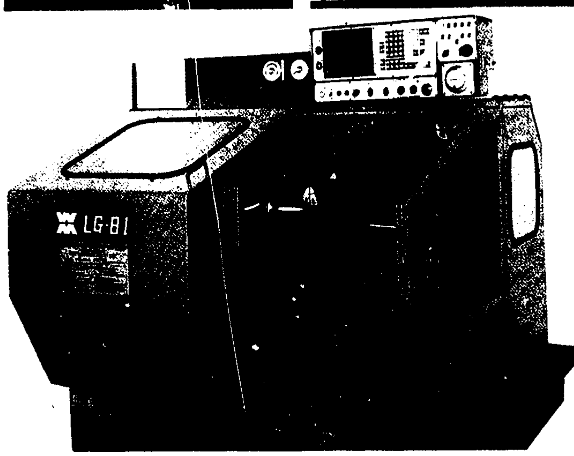
80 seconds C45 25 mm x 22 mm	78 seconds C35 11 mm x 20 mm	73 seconds C45 18 mm x 30 mm	55 seconds Alu 17 mm x 30 mm

We offer you a turning system with which you can machine your small parts about 30 percent faster, and we would like to see anybody beat our speed.









Top left photo:

With our LG 70 and LG 81 CNC lathes, you lose no time with idle time. The linear revolver takes care of this. It brings the tool to the work by the shortest path. Instead of large motions, the slider requires minimal motion, and this saves time.

Top right photo:

While a disc revolver requires a rotary motion to bring up a new tool, the slider often requires only an infinitesimal motion. In fractions of a second, a new tool is in operation. You can't get any more economical than this in turning small parts.

Center left photo:

A constant operating temperature from the start is a prerequisite for uniform precision lathe work. Our heat-removing oil bath establishes this condition. It assures high thermal stability and thus prevents expansion of the axes due to heat. The result is a top quality surface: 0.001 mm roughness for steel and 0.0006 mm for aluminum from the first part to the last. And this is guaranteed!

Center right photo:

The Fanuc 6 T CNC control is distinguished by its reliability and ease of operation.

Lower left caption:

Specification for the LG 70 CNC lathe:

Maximum dimensions of machinable part: 100 mm diameter, 100 mm length
Swing over bed: 320 mm
Spindle turning speed range: 40 to 4,000 rpm, stepless control
Longitudinal slider motion: 250 mm (Z axis)
Transverse slider motion: 480 mm (X axis)
Spindle drive power: 5.5 kW DC (bed slider)

Lower right caption:

Specification for the LG 81 CNC lathe:

Maximum dimensions of machinable part: 120 mm diameter, 120 mm length
Swing over bed: 460 mm
Spindle turning speed range: 40 to 4,000 rpm, stepless control
Longitudinal slider motion: 240 mm (Z axis)
Transverse slider motion: 550 mm (X axis)
Spindle drive power: 11 kW DC (bed slider)

9160
CSO: 3102/201

TRANSPORTATION

DOUBT CAST ON ECONOMIC FEASIBILITY OF MAGNETIC LEVITATION

Hamburg STERN in German 1 Apr 82 pp 37-38

[Article by Peter Thomsen: "A Train Without A Future"]

[Text] In the middle of the uninhabited waste between the abandoned secondary Ems canal and the Bundeswehr training ground at Meppen, an endless concrete beam crosses the billiard table-smooth Emsland. Like a larger than life-size windowbox, it rests on massive supports 6 meters in the air and disappears in the hazy distance on the horizon. Occasionally, a group of workers appears, climbs the airy structure and performs some task on the supports. "Fine tuning," construction supervisor Peter Wurm says. "We are adjusting the beam to exactly one-tenth of a millimeter."

Accuracy like this is mandatory, because in 1 year the concrete strip is supposed to carry a special type of high-speed train: The "Transrapid 06," which is supposed to reach speeds of 400 kms/hour and, in the distant future, compete with airplanes.

Transrapid 06 is a railroad without rails and wheels. Powerful electromagnets on the undersides of the concrete beam exert a pull on the chassis of the railroad car and keep it in suspension. A complicated system of electronics regulates the magnetic force in such a way that the train and the beam do not make contact with each other and always remain at a distance of approximately 1 cm.

Leading German industrial companies have working on the "railroad of the 21st century" for 13 years: The aircraft constructor Messerschmitt-Boelkow-Blohm, the locomotive and tank builder Krauss-Maffei, the electrical companies Siemens and AEG-Telefunken, as well as Thyssen-Henschel and Brown Boveri. "Transrapid 06" is supposed to prove that magnetic levitation technology can function reliably in continuous operation at maximum speed, in heat, rain and ice. "That will be our greatest hour," enthuses Juergen Borchert, the Krauss-Maffei engineer who heads the project in Munich.

One-quarter of the 32-kilometer long test track in Emsland in already finished. The 54-meter long power unit, which has 200 seats, is now being completed in Munich and will begin operation in the spring of next year. Following a 10-year test program, the operators of the magnetic railroad plan to submit a report of their experiences to the government. After that, the facility, which cost DM 440 million and was financed with tax money, will be torn down, since there is no "transportation need," as the bureaucrats call it, in this remote region.

It is extremely doubtful whether there is any chance at all for magnetic rail technology. The Bundesbahn, at least, is keeping its distance very obviously from this novel form of transportation. "We are certainly not opposed to magnetic levitation technology," is the assurance of Dietmar Luebke, president of the Development Planning Department in the central office in Munich. "But there has been no sign so far that it is profitable." These are the major objections of the Bundesbahn to fashionable magnetic levitation:

--The magnetic railroad requires its own "rails" and it cannot be integrated into the existing network. This contradicts one of the basic requirements of the Bundesbahn for any new method of rail transportation.

--The magnetic railroad train must be light in order to levitate. Like an airplane, it is only suited to carrying people or light objects. Carrying freight is the most important source of revenue for any railroad.

--The magnetic railroad requires more energy than traditional wheel-to-rail technology. At high speeds, energy is used mostly to overcome wind resistance. That is the same for both systems. In the case of the magnetic railroad, there is the additional current required to lift the vehicle.

--The magnetic railroad is not, as is claimed, quieter than the conventional railroad. At high speeds, wind noise conceals all other sources of noise. The slipstream is equally strong for both systems.

Officials of the Bundesbahn are not even willing to concede the main drawing point, superior speed, to the magnetic levitation railroad. The principle of propulsion used in Emsland, they argue, cannot be employed on a large scale: The zig-zag cables laid in the concrete beam, which pull the train forward by means of mobile magnetic fields ("linear propulsion"), require huge amounts of copper and make long distances prohibitively expensive. If the propulsion unit is moved into the vehicle, the track becomes less expensive, but the vehicle has to be supplied with current from the outside. The Bundesbahn knows from its own experience that the sustained maximum speed is limited to 300 kms/hour with the pantographs now in use. When the crack new French train "Train a Grande Vitesse" (TGV) established the current world record of 380 kms/hour in February 1981, it was accompanied by an enormous shower of sparks.

Railroad engineers confidently believe that they can easily achieve 300 kms/hour with wheels and rails--without the drawbacks and developmental risks associated with the new levitation technology. They plan to prove it in the next few years with a driving unit on a 23-kilometer long arrow-straight test tracks, also in Emsland.

The French have been reaching a speed of 260 kms/hour on scheduled routes since September 1981 with the TGV. They laid the track for their supertrain in a straight line across hills and valleys. Freight trains continue to use the old tracks from the 19th century, which have few gradients but many curves. Using this method, the new track for the TGV cost only DM 6 million per kilometer.

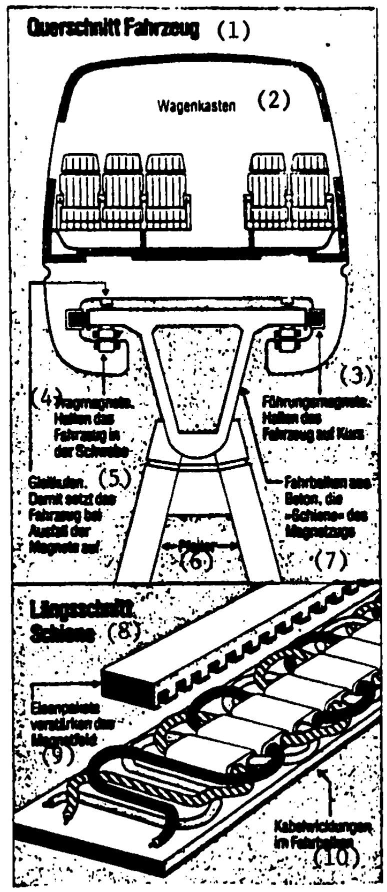
The Bundesbahn, however, is paying up to DM 37 million per kilometer for its new tracks--because it is clinging obstinately to the idea of "mixed traffic," freight and passenger trains on the same line. As a consequence, new lines have to avoid curves (because of the high-speed trains) and have to be built without steep gradients (because of the freight trains). This method of construction requires expensive viaducts and tunnels.

Critics accuse the Bundesbahn of having trapped itself in a blind alley with this idea. In spite of this, it wants nothing to do with "pure passenger traffic." Dietmar Luebke, the planner of the railroad's future, states, "New routes without freight traffic are not profitable."

At the Ministry for Research in Bonn a study is currently in progress on an imaginary magnetic levitation railroad from Paris to Frankfurt. In the study, the cost per kilometer is estimated at DM 17 million--almost three times as much as the French TGV technology. A complete magnetic railroad network, linking the principal central European cities, would cost about DM 70 billion. In view of the horrendous Bundesbahn deficit and depleted European treasuries, plans like this appear totally unrealistic at the moment.

"Let us be honest," says Karl Schmidt, marketing head at Krauss-Maffei, "the opportunities for a magnetic railroad are poorer in the FRG and they are much better abroad." His company is campaigning in Saudi Arabian daily newspapers for a high-speed magnetic rail link between Jedda and Mecca--so far without success.

Magnets Instead of Wheels
Magnetic trains are regarded as absolutely impossible to derail, because the vehicle wraps around the guide rail. Magnets move the vehicle without the car and rail touching each other. Complex windings in the guide beam (lower picture) create a mobile magnetic field when current is passed through them and pull the train forward.



Key:

1. Cross section of the vehicle
2. Vehicle body
3. Guide magnets. They keep the vehicle on course
4. Support magnets. They keep the vehicle in suspension
5. Skid. The vehicle comes down on it if the magnets fail
6. Pillar
7. Concrete guide beam, the magnetic train's "rail'
8. Longitudinal section of the rail
9. Iron cores increase the magnetic field
10. Windings in the guide beam

9581
CSO: 3102/233

END