

UNDERGROUND PRODUCTION - Wilhelm Löbbe and Konrad Grebe



Wilhelm Löbbe and Konrad Grebe are inducted for the longwall plow, -rst installed in Ibbenbüren coal mine in Germany in 1941. Konrad Grebe was nominated as one of the inventors/developers of the plow for coal production in thin seams. Grebe worked for Ibbenbüren colliery and was the man who drove the development of plowing with the -rst tests, etc. He had the idea of using plows as an extraction machine. The -rst test machines were made at the

mine's workshop. Grebe was nominated "Pioneer of labour" in 1943. Separately, Caterpillar nominated Wilhelm Löbbe (1890 - 1950), who "invented and re-ned the coal plow in an attempt to modernise and mechanise underground coal mining. The invention of the 'Loebbe Plow' in the early days laid the foundation for establishing plowing as the preferred high-productivity longwall mining method for seam heights below 1.8 m. Wilhelm Löbbe worked as the chief engineer until 1950 for Westfalia Lünen, which was the -rst manufacturer of plows, besides the Ibbenbüren mine workshop. Later of course Westfalia became DBT, then Bucyrus and now Caterpillar. Löbbe transferred the results of the tests, etc. into a real engineered machine. The combination of chain conveyor and plow into one machine was Löbbe's accomplishment.

Returning to the Caterpillar nomination, Dr. Uli Paschedag, Global Product Manager Underground, Caterpillar Global Mining and a plow expert himself, explains that "plowing is a long-known coal mining method invented in the early 1940s. Many different plow models were designed and trialled underground until in the mid-1990s only two models remained: the Reissshakenhobel® or base plate plow and the Gleithobel® or gliding plow. Power and plow speed have increased steadily over time; however it wasn't until 1989 when the biggest missing link of plow systems was overcome: the invention of automated plowing, using electrohydraulic controls, with de-ned cutting depths (the so-called incremental plowing). This -nally allowed plowing to become the most productive mining method for seams below 1.8 m thickness." He added "This technology step like most inventions in plowing came from Caterpillar's predecessor Westfalia Lünen. Another milestone was yet another invention by Westfalia as the world's -rst and only really mine-worthy and rugged control system, the PM 4 was introduced in 1993. Today, three standard plow systems are oered by Caterpillar together with tailor-made plow shields and the currently most advanced electrohydraulic shield control system, the PMC®-R. Installed cutting power of up to 2 x 800 kW, coupled with a blazing plow speed of up to 3.6 m/s and world-leading automation capabilities leads to an integrated longwall mining system for medium and thin seams which produces more clean coal at lower cost than any shearer can in medium and thin seams".

Ibbenbüren coal mine in Germany is still producing and -of course- only with plows as it only has thin seams. Caterpillar continues to develop the technology with the latest innovation being the Cat® GH800B longwall plow system, designed for mining very low coal seams at high rates. Building on the attributes of the proven GH1600 plow system, the Caterpillar longwall team in Lünen, Germany, worked with the Ibbenbüren mine to design and construct a system

for mining an anthracite seam averaging only 0.85 m thick. The result is the GH800B plow and associated longwall system, which is now successfully operating in Ibbenbüren—where the seam does not exceed 1.0 m in height. Cat says its GH800 plow, with an installed power of 2 x 400 kW, has been the plow of choice for seam heights from 0.9 to 2.0 m, regardless of seam inclination or coal hardness. But, the lower the coal seam, the more difficult the extraction process. Flexibility, reliability, efficiency and serviceability of the whole system had to be re-tuned for maximum productivity in such a minimal height, but several key modifications led to success. The armoured face conveyor (AFC) modifications for the GH800B plow system include PF4 plow line pans with a replaceable top trough and a new plow guide made of a one-piece casting to provide extra strength and durability while being much lower in height than the previous welded version. External dogbone connectors between the line pans and a very strong and flexible relay bar between the AFC and the roof supports (shields) further adapt the conveyor for very low seam operation. To increase coal throughput, the engineering team widened the conveyor cross-section with extended side plates. The plow body of the GH800B system was adapted to cutting heights from a maximum 1.55 m to as low as 0.75 m. An optimised design at both ends of the plow body helps load more coal onto the face conveyor and reduces the amount of cutting power consumed by this process. The Cat GH800B enables an effective horizon control system, which provides the ability to follow the seam line without cutting adjacent rock. The Cat low seam roof supports were also specially designed for this application. Shortened canopies avoid collision with the plow even in their lowest position, and the shield canopies are 80 mm thinner to create a more ergonomic working environment for the face crew. A canopy water spray sequence, synchronised with the cutting plow, keeps dust levels down. Cat automation of the complete plow longwall as well as remote control of all functions and adjustments enables high production with no personnel at the face. The system enhances safety and minimises operating cost. The new GH800B plow system went underground for operation at Ibbenbüren mine in the fourth quarter of 2013. In addition to impressive daily production, the new system reduces operating and maintenance costs by about 50% compared to a nearby coal face. An advance rate of as much as 10 m/d reveals the enormous production capability of the system. The Cat GH800B plow system is going to be operated in -ve consecutive longwall panels of the Ibbenbüren mine.