

Extrusion Technology

*Complete Extrusion Lines for plastic pipes
by KWH Pipe Technology*



Raw material handling system

Raw material handling system is to transfer raw materials to the feed hopper of the extruder and to keep the manufacturing process continuous. Raw material handling system comprises the following components:

Vacuum conveyor, which transfers raw material granulate from the storage bunker to the feed hopper of an extruder, or alternatively to an optional dryer.

An optional **raw material dryer** completed with a **vacuum conveyor**, which transfers raw material granulate from the dryer to the feed hopper of the extruder. Tubes for transporting of raw material are of stainless steel. Air ducts of the raw material transfer system are of aluminum alloy.

RAW MATERIAL HANDLING SYSTEM	Type 1	Type 2	Type 3	Type 4
Capacity kg / h	500	800	1000	1500

Gravimetric control system (GCS)

Gravimetric control system (GCS) monitors the raw material consumption (mass flow, kg/m) in real-time mode and compares it to the haul-off speed (m/min). If any deviation of actual metric

weight from its calculated value occurs, GCS corrects the speed of the extruder or the speed of the haul-off unit.



According to the Customer's demand and requirements the GCS instrumentation and software are delivered either for single-flow or multi-flow monitoring.

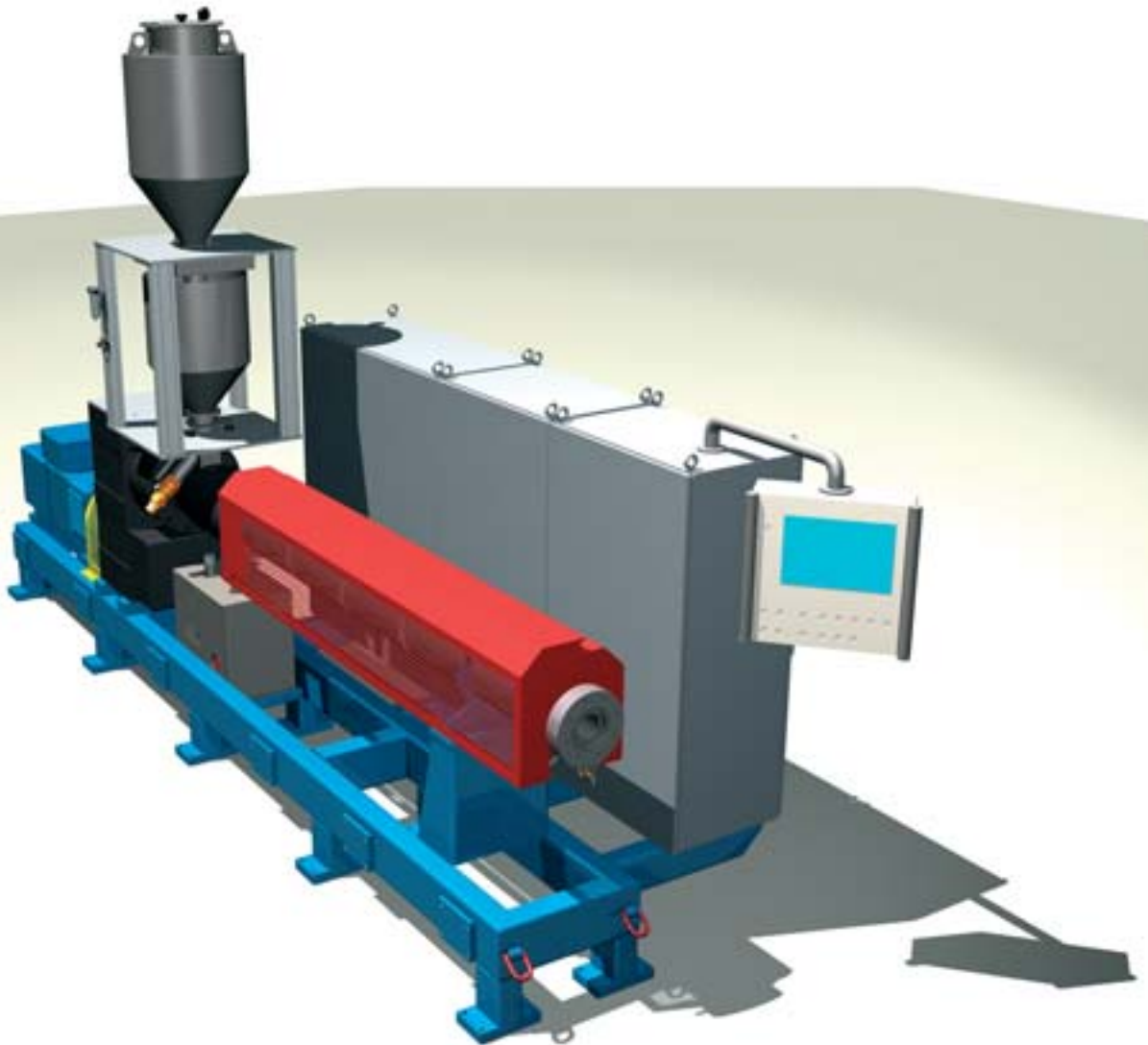
Basic GCS is comprised of following components:

- * Feed hopper
- * Weighting hopper
- * Metering valve and frame
- * PLC with single user interface
- * Line speed measurement with closed loop control
- * Screw rotary speed measurement
- * Measurement of screw output per one revolution (gr/r)
- * Interfaces for upper level control and printer (optional)

Single screw extruders

The pipe extruder is designed for the manufacturing of polyolefin pipes.
The product range comprises extruders with screw diameters from 18 to 150 mm.

Barrier screw	Nitrated steel, HV 950 – 1000
Grooved feed bush	Used with a barrier screw enables high plastification rates and low melt Temperatures
Extruder barrel	Nitrated steel, HV 950 - 1000
	Temperature control zones, heating/ cooling
	Heating zones of extrusion die flange



TYPE		EX 18-26-1,5 AC	EX 25-30-4,5 ACS	EX 50-30-30 AC	EX 75-32-150 DC	EX 90-32-225 DC	EX 120-32-350 DC
Screw diameter	mm	Ø 18	Ø 25	Ø 50	Ø 75	Ø 90	Ø 120
Length / diameter ratio	L / D	26	30	30	32	32	32
Drive power	kW	1,5	4,5	30	150	225	350
Output HDPE	kg / H	1,5	6	100	500	700	1000

Extrusion tools

The KWH pipe extrusion dies enable pipe extrusion of polyolefin materials, such as PE (HDPE, MDPE) and PP. The die-heads are of spiral distribution type. Dimensioning of the flow channels is based on the rheological characteristics of the most frequently used types of plastics.

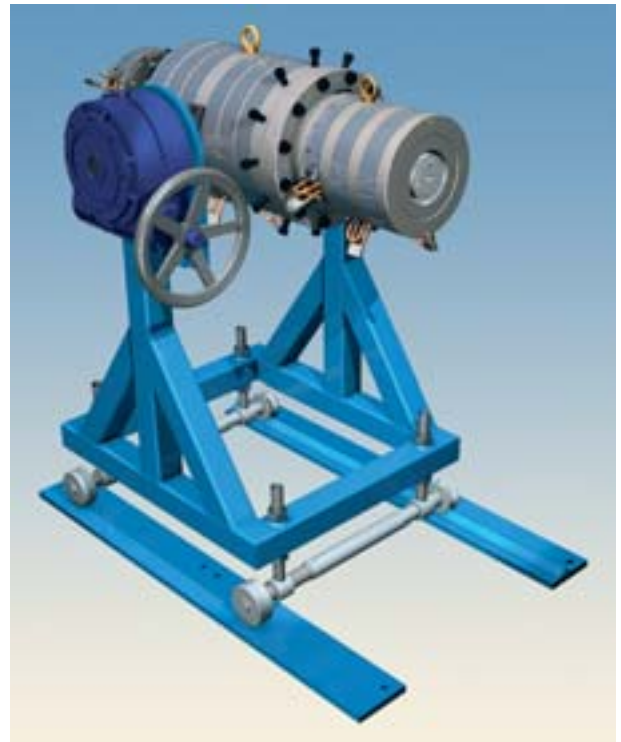
Advantages:

- * low head volume enables short dwell times and low thermal stress impressed upon the melt;
- * low pressure build-up even at high material throughput at low stock temperature;
- * precise distribution of the melt which minimizes the wall thickness deviations;
- * short self-cleaning time when changing the colour of raw material;
- * high mechanical characteristics of the pipe.

An extruder is to be completed with tool sets to cover specific pipe dimension ranges. Each toolset includes:

- * Extruder head flange (delivered with an extruder)
- * Adapter
- * Pipe die-head
- * Die-mandrel set

The complete die-head is of modular design. Each die-head covers a specific diameter range. To cover different pressure classes a comprehensive range of interchangeable die and mandrel extensions are available.



Calibration tools

Calibration gives the pipe its final shape and size.

Vacuum calibration sleeves

Pressure calibration sleeves



Pipe calibration tanks

The calibration tank can be either of single or double chamber construction. The bottom part of the unit is used as a water reservoir, which ensures precise temperature control in the calibration tank. The temperature of the calibration tank is

kept on the desired level by a thermostat. The calibration tank is installed on the rail tracks, anchored to the workshop's floor. The longitudinal movement of the calibration tank is motorised.

Vacuum calibration tanks



TYPE	VCA 63-6	VCA 110-6	VCA 250-6	VCA 400-6	VCA 630-6	VCA 800-6	VCA 1000-6	VCA 1200-6
Pipe diameter Ø, mm	10 - 63	20 - 110	50 - 250	63 - 400	110 - 630	250 - 800	500 - 1000	630 - 1200

vacuum calibration tanks

Pressure calibration tanks

TYPE	PCA 1200	PCA 1600
Pipe diameter Ø, mm	400 - 1200	710 - 1600

pressure calibration tanks

Spray cooling baths



TYPE	SB 63-10(6)	SB 110-10(6)	SB 250-10(6)	SB 400-10(6)	SB 630-10(6)	SB 800-10(6)	SB 1200-10(6)	SB-1600-6(4)
Pipe diameter Ø, mm	10 - 63	20 - 110	50 - 250	63 - 400	110 - 630	250 - 800	630 - 1200	710 - 1600

cooling tanks

Haul-off units

The haul-off unit grips the pipe over a long length and pulls it at a constant speed. The haul-off consists of a number of pulling belts around the pipe. The pulling belts, which are located under the extrusion axis, are mechanically adjustable.

The pulling belts, which are located above the extrusion axis, are driven pneumatically.



TYPE	PVL 110 / 3	PVL 250 / 4	PVL 400 / 4	PVL 630 / 6	PVL 800 / 6	PVL 1000 / 8	PVL 1200 / 10	PVL 1600 / 12
Pipe diameter Ø, mm	16 - 110	40 - 250	40 - 400	110 - 630	140 - 800	140 - 1000	315 - 1200	710 - 1600
haul-off units								

Pipe cutting equipment

Pipes with a diameter over Ø 160 mm are usually cut to the standard length.

Circular saws

Circular saws for cutting pipes of outer diameter up to Ø 250 mm.

TYPE	CIS 110	CIS 200	CIS 250
Pipe diameter Ø, mm	(32) 63 - 110	63 - 200	63 - 250
circular saws			

Planetary saws

The planetary saw is delivered as a single cut unit. By request any planetary saw can be equipped with two-step cutting heads. The initial cut is executed by disk saws and the final operation by cutting blades. In that way ingress of sawdust inside the pipe is prevented.



TYPE	PLS 250	PLS 400	PLS 630	PLS 800	PLS 1200	PLS 1600
Pipe diameter Ø, mm	32 - 250	40 - 400	110 - 630	200 - 800	315 - 1200	710 - 1600
planetary saws						

Pipe coilers

Pipes with a diameter up to Ø 160 mm are usually coiled using pipe coilers.

TYPE	COL 63 23-63	COL 90 compact	COL 110	COL 160
Pipe diameter Ø, mm	23 - 63	32 - 90	32 - 110	90 - 160
pipe collars				

Process control equipment

The control system constantly monitors the manufacturing process on its every stage and corrects current production parameters to the set value.

Basic control system provides following services to the manufacturing process:

- * speed control of all installed drives of the production line;
- * temperature control and adjusting to the set point;
- * control of water level in calibration tanks and spray cooling baths;
- * pressure control of raw material melt;
- * raw material flow control;
- * alarm reporting and diagnostics.

Integrating the **gravimetric control** into the basic control system of an extrusion line enables enhanced process monitoring and run mode optimisation.

Due to the effective process management, the operating control system optimizes the pipe manufacturing and saves raw materials and other resources.

The process control system of an extrusion line is PLC-based. The PLC-unit of an extruder usually serves the entire production line.



Extended operation control system

The operation control system of a single extrusion line can be connected to the PC-based upper level control system, which integrates and administers control systems of all installed production lines of the factory.

The configuration of the system enables effective and comprehensive process control, including operation security and co-ordination. The extended operation control system allows the manufacturing process automation.

Wall thickness ultrasonic measure control (UMC)

The **wall thickness ultrasonic measure control** is to maintain the high and stable product quality and to minimize consumption of specific raw materials.

The UMC controls the following operations and related parameters:

- * metric weight (haul-off /extruder);
- * minimum wall thickness (haul-off);
- * wall thickness profile (die head centering);
- * diameter (vacuum);
- * extruder/start-up ramps;
- * component dosing;
- * co-extrusion.

The core of the ultrasonic measure control system is the high-speed ultrasonic evaluation electronics and the sensor system. The probe-to-specimen contact is established through a water section. The ultrasonic sensor converts the electronic transmission pulse to an acoustic signal and after scanning with it the measuring object converts the reflected acoustic echo signals to electronic pulses, which are processed by evaluation electronics.

The processed data is displayed on the UMC output screen and used by the **process control system** to correct the performance of the extrusion line.

TYPE	OPERATION PRINCIPLE	MEASURING POINTS	DIAMETER RANGE
Measuring chamber	static measurement	4 - 8	0,5 - 125 mm
Flange-fitted measuring chamber	static measurement	4 - 8	32 - 450 mm
Flange fitted scanner	reversing 360°	upto 400	16 - 450 mm
Openframe scanner	reversing 360°	upto 400	32 - 1600 mm
Calibrating sleeve with integrated measuring ring	static measurement	8 - 36	50 - 1600 mm
Calibration sleeve with adapted measuring ring	static measurement	8 - 36	110 - 1600 mm
Electronically rotating scanner with measuring ring	electronically rotating, static sensors	upto 50.000	110 - 1600 mm

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KWH Pipe Ltd Technology
P.O. Box 383
FI-65101 Vaasa, Finland

Telephone +358 6 326 5511
Telefax +358 6 326 5690
www.kwhtech.com
www.kwhpipe.com

