

**SPECIALISTS IN
GRAIN STORAGE SILOS
SINCE 25 YEARS**

WWW.YOURSILOENGINEER.COM

INTRODUCTION

01. [YourSiloEngineer](#) is a widely experienced team and related network of professionals in the grain silo and storage sector.

02. [YourSiloEngineer](#) is completely manufacturer and supplier independent, so neutral in any of its considerations.

03. [YourSiloEngineer](#) provides practical experience with customers in different sectors and geographies, thus being able to understand each single circumstance.

04. [YourSiloEngineer](#) has been facing and solving different types of requests, from different origins covering practical, technical, commercial and R&D aspects.

05. [YourSiloEngineer](#) offers his indeep experience in grain storage to help different industries in technical solution findings, improvement of grain management and reduction of losses of valuable cereals.



OUR PERSPECTIVE OF GENERAL MARKET SITUATION

- Grain silos market will continue developing over the years due to the increase in world population and the necessary improvements of storage infrastructures as well as in processing industries.
- There is a strong trend in favour of steel silos, due to its lower price compared to other solutions, start-up speed and ease of maintenance.
- Silo is considered a simple commoditized product, not a technically complex product that stores sensible, perishable and valuable crops.
- Current manufacturers have been in the market for many years and they have evolved very little leaving an opportunity window to new entrants with innovative proposals and customer service orientation.
- Most current suppliers are very much product oriented, leaving application-, plant management and know-how about grain storage practices out of their scope of supply, leading to significant profit and product losses for grain plant operators.
- There is a lack of after sales support, and capability of project evaluation from different sectors.
- There is a significant practical lack of knowledge on norms and its application on silos and grain storage plants.





Consultations on services and professional advice continue to increase

- Silo plant design, implementation, operations and process improvements.
- Grain storage practices.
- Design norms, standards and its applications.
- Maintenance practices, including silo cleaning.
- Training of plant staff.
- Technical silo (aerial, internal and external) / silo plant evaluation.
- Consultations arrive from diverse silo and grain handling manufacturers, turn key suppliers, investors, operators, governments, insurances...



7-11-2002

SERVICES CAN BE OFFERED TO DIFFERENT SECTORS



Producers of silos, handling equipment and other related agricultural equipment

- Manufacturers of silos
- Manufacturers of dryers and handling equipment
- Machinery and seed selection
- Machinery for feed mills and biomass.
- Equipment of agro-industrial plants



Engineering companies offering / requiring grain storage solutions into /from the market

- Engineering and industrial consultancies
- Dealers of agricultural equipment
- Integrators
- Agricultural consultants



End user, investors or traders, operating or investing in grain storage equipment

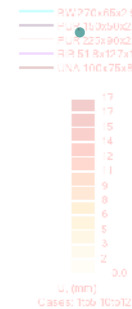
- Farmers, cooperatives and Agroholdings
- Traders and port authorities
- Breweries and malting plants
- Feed and Flour plants
- Processors
- Bio Mass operations
- State agencies or government owned entities
- Insurance companies
- Investment funds

SERVICES CAN BE OFFERED TO DIFFERENT SECTORSv



PRODUCERS OF SILOS, HANDLING EQUIPMENT AND OTHER RELATED AGRICULTURAL EQUIPMENT

- Development of specific IT tools:
 - Silo calculation tools, according different norms
 - Calculation tools for steel structures
 - Aeration simulations tools
- Full product development
- Project management: project planning, 3rd party integration, on site supervision of the installation with own staff and/or certified subcontractors.
- Supplier evaluation
- Marketing and sales assistance
- Review of applicable design norms for silos, machines and electrical equipment
- Staff training in silo plant operations and grain management
- Support on R&D projects (handling equipment, silos)
- Silo design improvement
- Structural design: catwalks, towers, buildings
- Certification processes to receive required local certifications
- Manufacturing plants



SERVICES CAN BE OFFERED TO DIFFERENT SECTORS



ENGINEERING COMPANIES OFFERING GRAIN STORAGE SOLUTIONS INTO THE MARKET

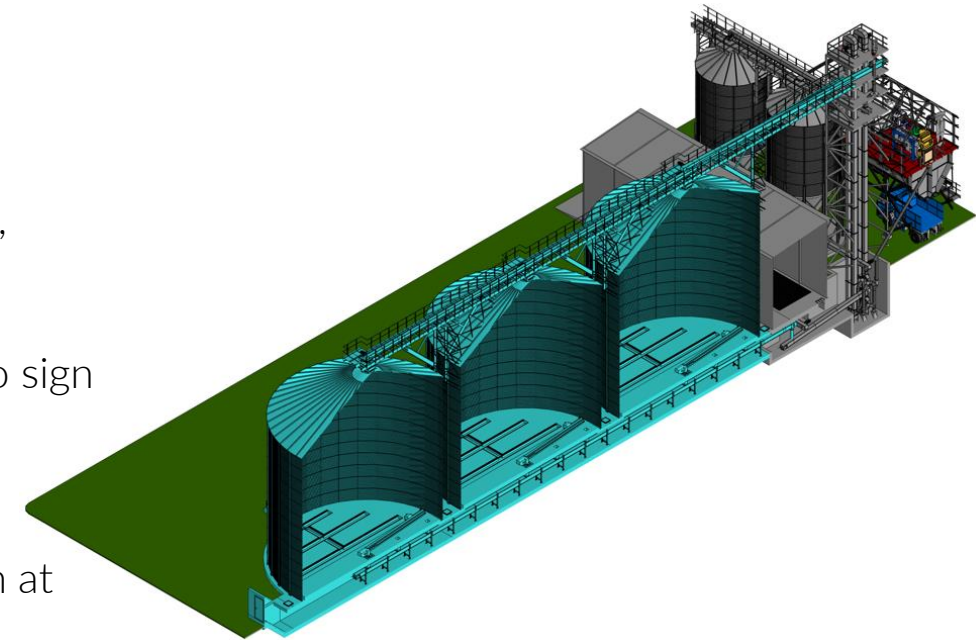
- Project management: Project planning, 3rd party integration and on site supervision of the installation with own staff and/or certified subcontractors
- Pre contract work, preliminary planning, flow chart definitions and lay outs for silo plants and processing industries
- Preliminary, manufacturer independent budgeting
- Technical tender or RFQ documentation evaluation
- Professional advice for purchase of machinery through analysis and professional technical evaluation of different offers
- Technical and economical analysis and evaluation of all project offers, investor assessment on investment decisions and understandable explanation of technical specifications
- Consulting services in quality control and machinery assembly
- Quality control services, including material acceptance and inspection at supplier warehouses, as well as on site reception
- Review of applicable design norms for silos, machines and electrical equipment
- Staff training in silo plant operations and grain management

SERVICES CAN BE OFFERED TO DIFFERENT SECTORS



END USER, INVESTORS OR TRADERS, OPERATING OR INVESTING IN GRAIN STORAGE EQUIPMENT

- Pre contract work, preliminary planning, flow chart definitions and lay outs for silo plants and processing industries.
- Preliminary, manufacturer independent budgeting.
- Technical tender or RFQ documentation definition.
- Soil analysis
- Professional advice for purchase of machinery through analysis and professional technical evaluation of different offers.
- Technical and economical analysis and evaluation of all project offers, investor assessment on investment decisions and understandable explanation of technical specifications.
- Project planning & Project management for investor, from contract to sign off of the installation.
- Consulting services in quality control and machinery assembly.
- Existing site inspections and evaluations
- Quality control services, including material acceptance and inspection at supplier warehouses, as well as on site reception.
- Review of applicable design norms for silos, machines and electrical equipment.
- Staff training in silo plant operations and grain management
- 3D implementation drawings and animations

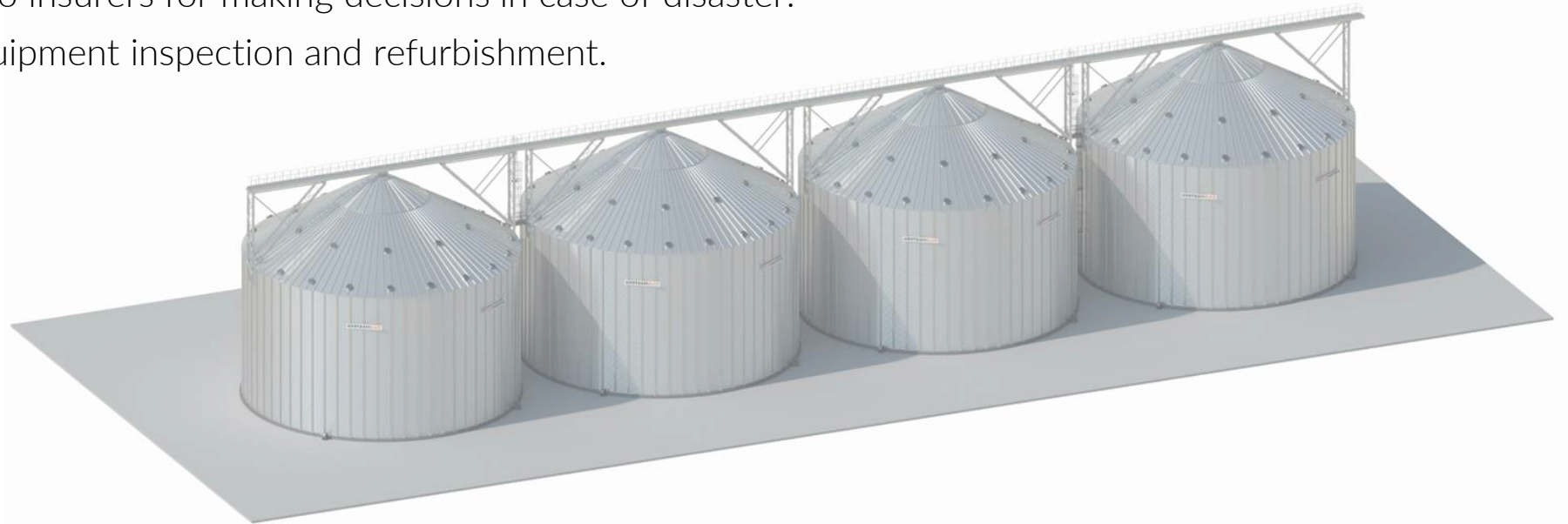


SERVICES CAN BE OFFERED TO DIFFERENT SECTORS



END USER, INVESTORS OR TRADERS, OPERATING OR INVESTING GRAIN STORAGE EQUIPMENT

- Economic and financial analysis of investment, and documentation for loan applications.
- Documentation management for state grants when applicable.
- Certification processes to receive required local certifications.
- Business plan evaluation.
- Professional advice to insurers for making decisions in case of disaster.
- Silo and handling equipment inspection and refurbishment.
- Project financing.
- Silo Cleaning
- MRO planning





End user, investors or traders,
operating or investing grain storage
equipment



Engineering companies offering /
requiring grain storage solutions
into /from the market

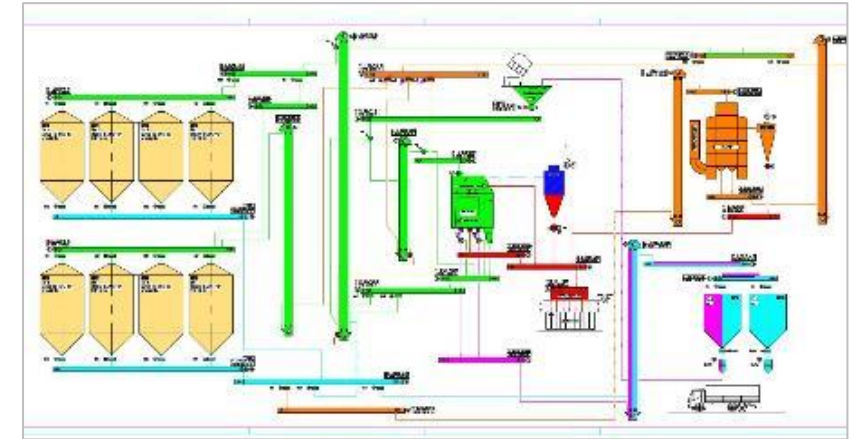
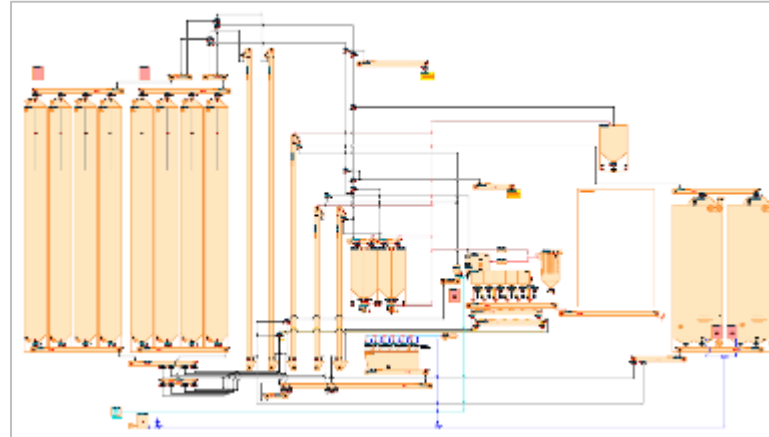


Producers of silos, handling
equipment and other related
agricultural equipment

- Review and analysis of statical reports of silos and steel structures
- Handling equipment performance calculations and improvements
- Advice on aeration & chilling performances
- Improved temperature, humidity and CO2 detections
- Inventory management systems
- Summarizing and development of operation and (preventive) maintenance procedures and simplified documentation, based on supplier specifications & previous experiences, as well as ad hoc machinery; intelligent MRO Software
- Silo cleaning
- Silo collapse inspection and analysis
- Silo site inspection and evaluations

REFERENCES AND EXAMPLES

SMART CONNECTION PROCESS ENGINEERING SOFTWARE



Technology:	Smart-wiring-Software	Traditional flow-chart
Number of elevators:	5 Elevators	6 Elevators
Design of conveyors	short distances	long distances
flexibility	parallel processes	less parallel processes
Review of flow-chart and concept	Easy	x (hardly possible)
Miscellaneous	maintenance-optimized component allocation	Not considered

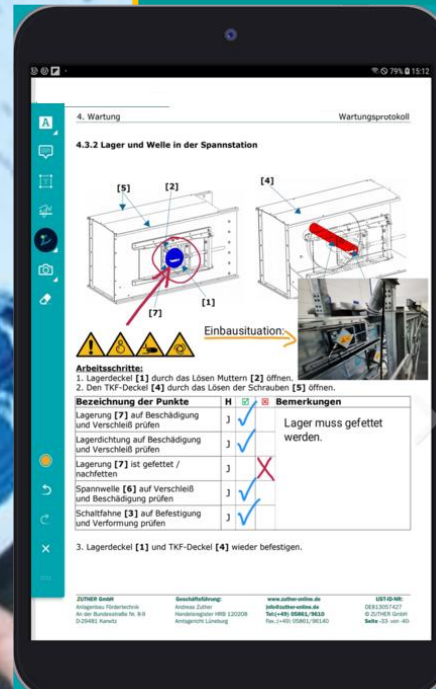


FIX

REFERENCES AND EXAMPLES

SILOPLANT MAINTENANCE MADE EASY:

- Organize the maintenance of your silo and grain processing plant
- Efficient, digital, simple
- Full extent, for each component
- Manufacturer-independent
- All machine documentation, machine history and maintenance routines in one single system, update it with your own experience
- Transparently organised maintenance
- On-time maintenance
- Reduction of downtimes
- No unplanned maintenance
- Extends the service life of the entire system
- Spare part identification and supply
- Consolidate various sites and improve routes



REFERENCES AND EXAMPLES

MATERIAL PROPERTIES IDENTIFICATION

- Material properties identification
- E.g. Rape or soja seed meal, other non free flowing products
- Pellet and non pelletized materials
- Following Eurocode procedures
- Research for adequate unloading systems and / or grain load assessments in silos and hoppers



3 Results

3.1 Bulk density ρ_s and bulk unit weight γ

The bulk density ρ_s and the bulk unit weight γ depend on the stress which has an effect on the bulk material, i.e. they generally increase when consolidation stress increases.

Table 1, Figure 1, and Figure 2 show the results of the measurements made. Table 2 shows the assessment according to BS EN 1991-4.

Consolidation stress [kPa]	Bulk density [kg/m^3]	
	Expanded meal	Soyabean meal
$\rightarrow 0$	588	648
7	634	696
25	633	695
50	632	695
120	632	695

Tab. 1: Bulk density for raw material

Bulk unit weight γ [kN/m^3]	Expanded meal	Soyabean meal
	5.8	6.5
Characteristic value γ_{ed}	5.8	6.5
Lower characteristic value $\gamma_{\text{ed,lower}}$	5.6	6.3
Upper characteristic value $\gamma_{\text{ed,upper}}$	6.0	6.7

Tab. 2: Bulk unit weight for raw material according to BS EN 1991-4



REFERENCES AND EXAMPLES

PROJECT MANAGEMENT

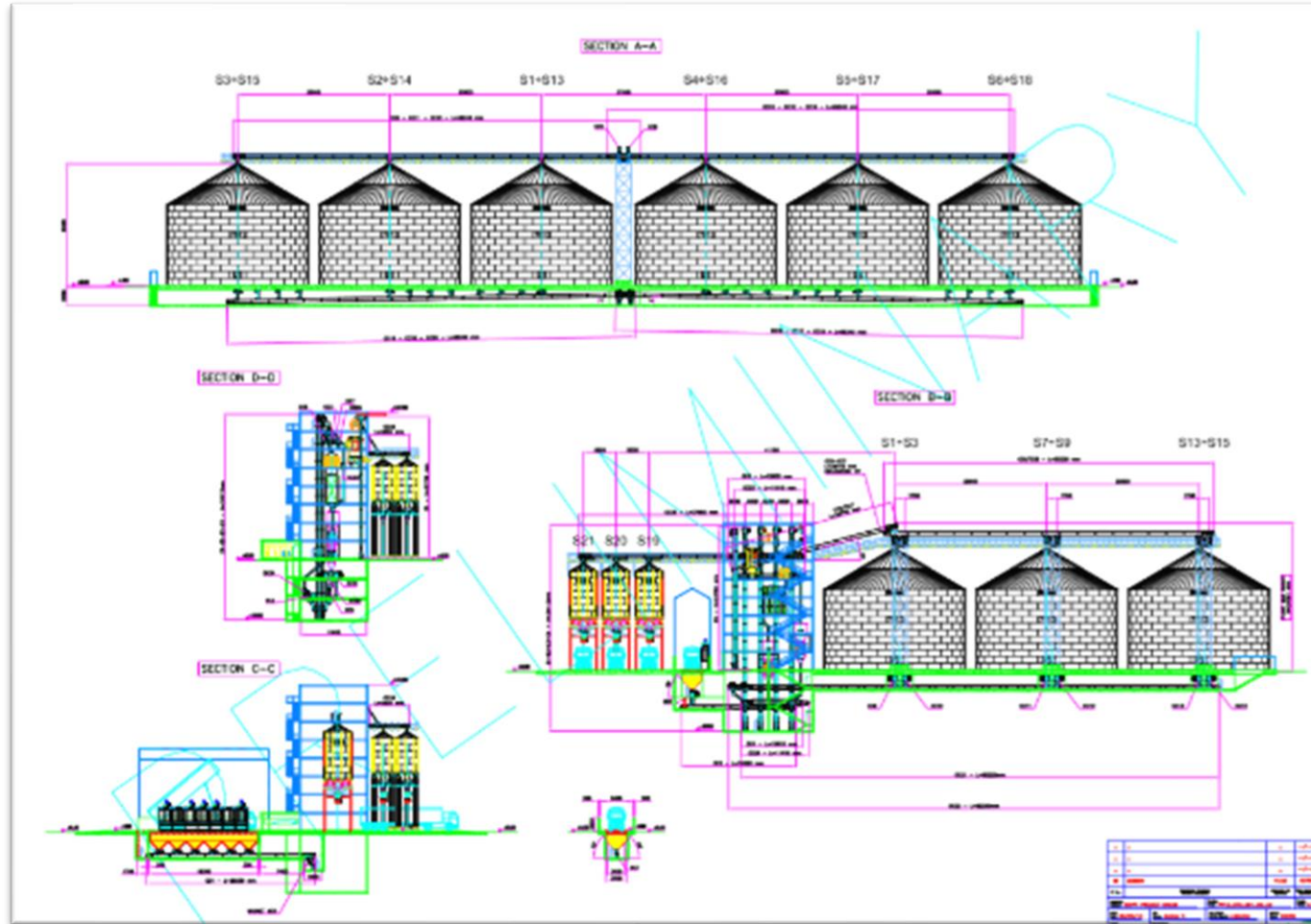
- 2 off 60 000 tons wheat storage plant
- @ 200 tons/hour handling
- Complete Project Management, material inspection, erection supervision, dry testing and commissioning
- Location: Egypt



60 000 MT



REFERENCES AND EXAMPLES

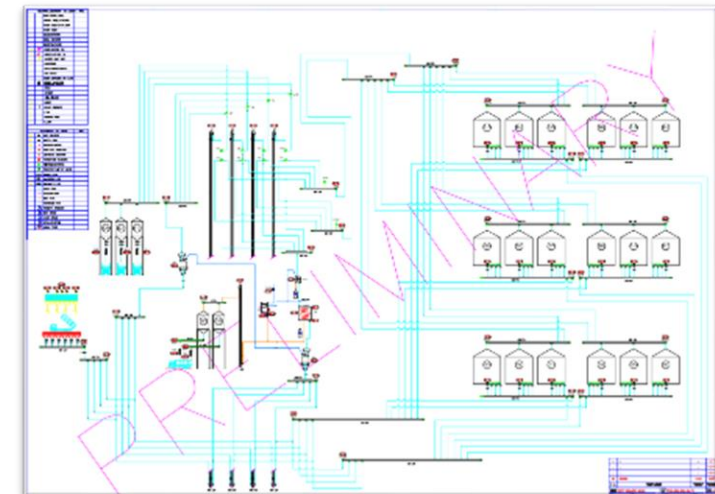


PROJECT DEFINITION

- PUBLIC TENDER
- 90 000 ton silo plant full layout and flow chart study for tendering purposes
- Elaboration technical specification documentation
- Location: Egypt



60 000 MT



REFERENCES AND EXAMPLES

SILO COLLAPSE

- Silo plant with 5000 ton silos
- Assistance after silo collapse
- Accident analysis and report
- Security and safety measures
- Dismantling process advice
- Location: Ukraine



REFERENCES AND EXAMPLES

PROJECT MANAGEMENT

- Port Project
- 240 000 tons storage
- Project management including erection supervision.
- Silos, steel structures, grain cleaning, ship unloading and handling equipment
- Statical calculation report for local authorities as per Eurocodes and specific country annex.
- Supplier audits (in factory)
- Setup of project specification for silos and handling equipment
- Location UK



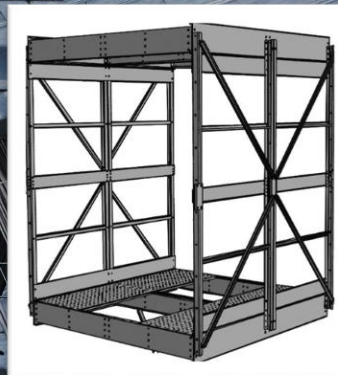
240 000 MT



REFERENCES AND EXAMPLES

STRUCTURAL DESIGN

- Statical calculation, design and manufacturing for a wide span catwalk suitable for a 1000 tons/hour conveyor of a renowned handling equipment manufacturer
- Project management including erection supervision.
- Statically calculation report for local authorities as per Eurocodes and specific country annex.
- Location Poland



REFERENCES AND EXAMPLES

INSECT INFESTATION

- Silos infested with insects
- Elaborated products with toxic substances
- Aeration study and calculation of the existing installations
- Chiller system proposal
- Cleaning of silo, catwalks and roof proposal
- Fumigation proposal
- Training of staff in chilling methods and TMS interpretation.
- Management of storage incidents (heated crops and infestations) in the form of online Tech support team that is available
- Location UAE



REFERENCES AND EXAMPLES

SILO FAILURE AND COLLAPSE

- Silo plant of international grain trader
- Assistance after silo failure
- Accident analysis and statically calculation advise.
- Bended silo due the use of FIFO unloader for rape seed meal.
- Dismantling process advice
- Location Germany 

REFERENCES AND EXAMPLES

SILO CATWALK DESIGN

- Design of complete new catwalks system package
- Calculation tool for silo catwalks
- Configuration tool for sales & engineering.
- Inputs masks with loads, type of silos, conveyor loads, result in a best technical / most economical proposal for the customer and fully norm compliant
- Tool returns full BOM, can be linked to ERP
- Assistance for machine tooling selecting
- Location: Manufacturer origin Canada 🇨🇦

Uniform Loads

UNIT	SI
Self Weight	1.00 kN/m
GSE	1.00 kPa
Chain Conveyor	1.00 kN/m
Main Load	2.00 kPa
Wind Load	150 km/h

Point Loads (Main CTW)

Wall (W)	0.00 kN
Peak A (PA)	0.00 kN
Peak B (PB)	NO

☐ Check CTW

Miscellaneous

Bin Size	15
n bins / Row	5
RSL ($\mu = 0.8$)	0.80 kPa

Suggested Catwalk Config

#	TYPE	ROOF
1	CTW 3 - B	STD
2	CTW 4 - C	STD
3	CTW 3 - A	STD
4	CTW 1	STD
5	CTW 4 - B	STD
6	CTW 2	STD
7	CTW 4 - A	STD



CATWALK SYSTEM CONFIGURATION TOOL

- Select one of these options:
- Generic Catwalk
 - Module 1. Single Row System
 - Module 2. Multiple Rows System
 - Module 3.



REFERENCES AND EXAMPLES

GRAIN SILO DESIGN REVIEW

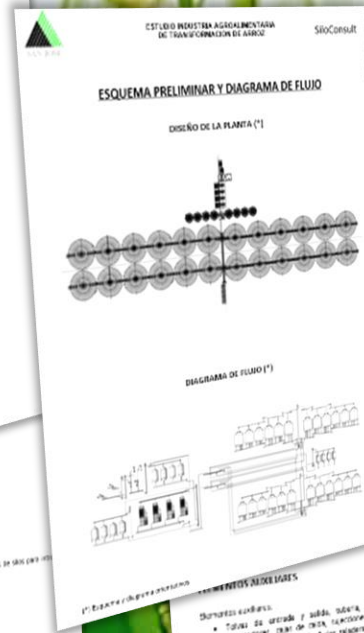
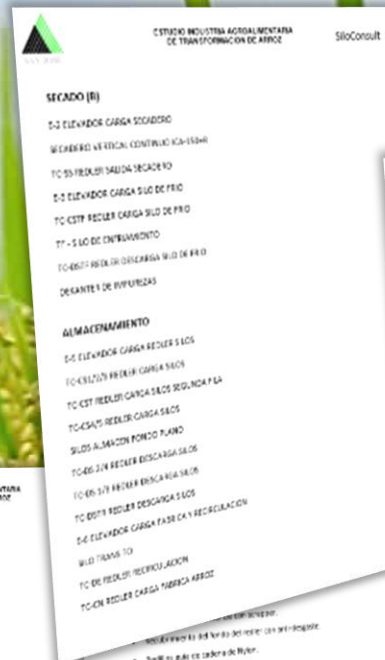
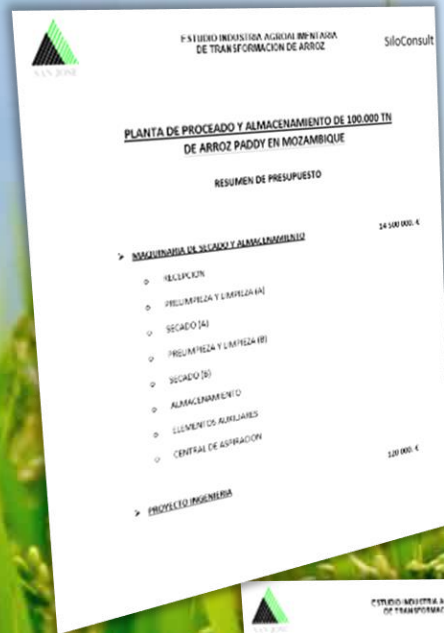
- Flat and hopper bottom design review
- Design, development and implementation of analytical calculation tool for grain silos
- Eurocode and ANSI norms, including snow, seismic and snow loads to various norms
- Returns full set of technical / commercial information
- Weights by parts
- Full costing & Sales pricing
- Bill of materials (BOM), suitable for ERP integration
- Analytical calculation report suitable for authorities approval
- Foundation loads
- Wall sheet roll forming line definition & acquisition
- Location International silo manufacturer EU

REFERENCES AND EXAMPLES

SILO PLANT PREDESIGN STUDY

- 100 000 tons RICE storage
- Preliminary plant design, under specific crops consideration
- Basic material list
- Preliminary budgeting for Business Plan Evaluation
- Detailed planning proposal for further action plans, including:
 - Study of electricity / energy in the area
 - Nearby infrastructures
 - Architectural drawings
 - Soils analysis for civil works
 - Location Mozambique, corporate investor

100 000



REFERENCES AND EXAMPLES



SILO COATING AND SEALING

- Special silo coatings to protect silo and silo content from direct sun impact and heating effects.
- Silo coating and sealing for improved fumigation processes.
- Silo coating to protect and or recover from corrosion.
- Location: Various



- Seismic factors to be considered in calculations in the example of “Philippines”
- Comparison ANSI – EU Codes in silo calculations
- Location various international specialized magazines

REFERENCES AND EXAMPLES

PLANT DESIGN AND SUPPLY

- 30 000 ton silo plant
- Full silo plant design
- Silos, catwalks, handling equipment, steel structures, automatization, scales, bellows
- Manufacturing
- Supply
- Project Management
- Architectural drawings & foundation loads
- Interphase coordination with local civil work contractor
- Erection supervision and commissioning
- Location: Morocco, flour mill



30 000 MT



REFERENCES AND EXAMPLES

PLANT DESIGN AND SUPPLY

- 240 000 tons silo plant
- First basic design
- RFQ Lay out
- Final lay out
- Calculation, manufacturing and delivery of silos and structures
- Catwalk and tower design to 500 tons/hour equipment
- Accommodation to local seismic and snow load norms
- Project management: Deliveries, erection, architectural drawings, tower design, third party full equipment integration, erection supervision
- Location; Port Odessa, Ukraine



240 000 MT

REFERENCES AND EXAMPLES

SILO INSPECTION AND MAINTENANCE

- Site inspections
- Silo non-destructive testing
- Silo repair with rope access
- Silo cleaning and hygienization
- Re- Sealing of silos base and bolts
- Re-Sealing of vertical and horizontal joints
- Corrosion elimination on roof and cylinder
- Special coatings for temperature reduction
- Settlement checks silos and towers
- Location: Various sites, world wide

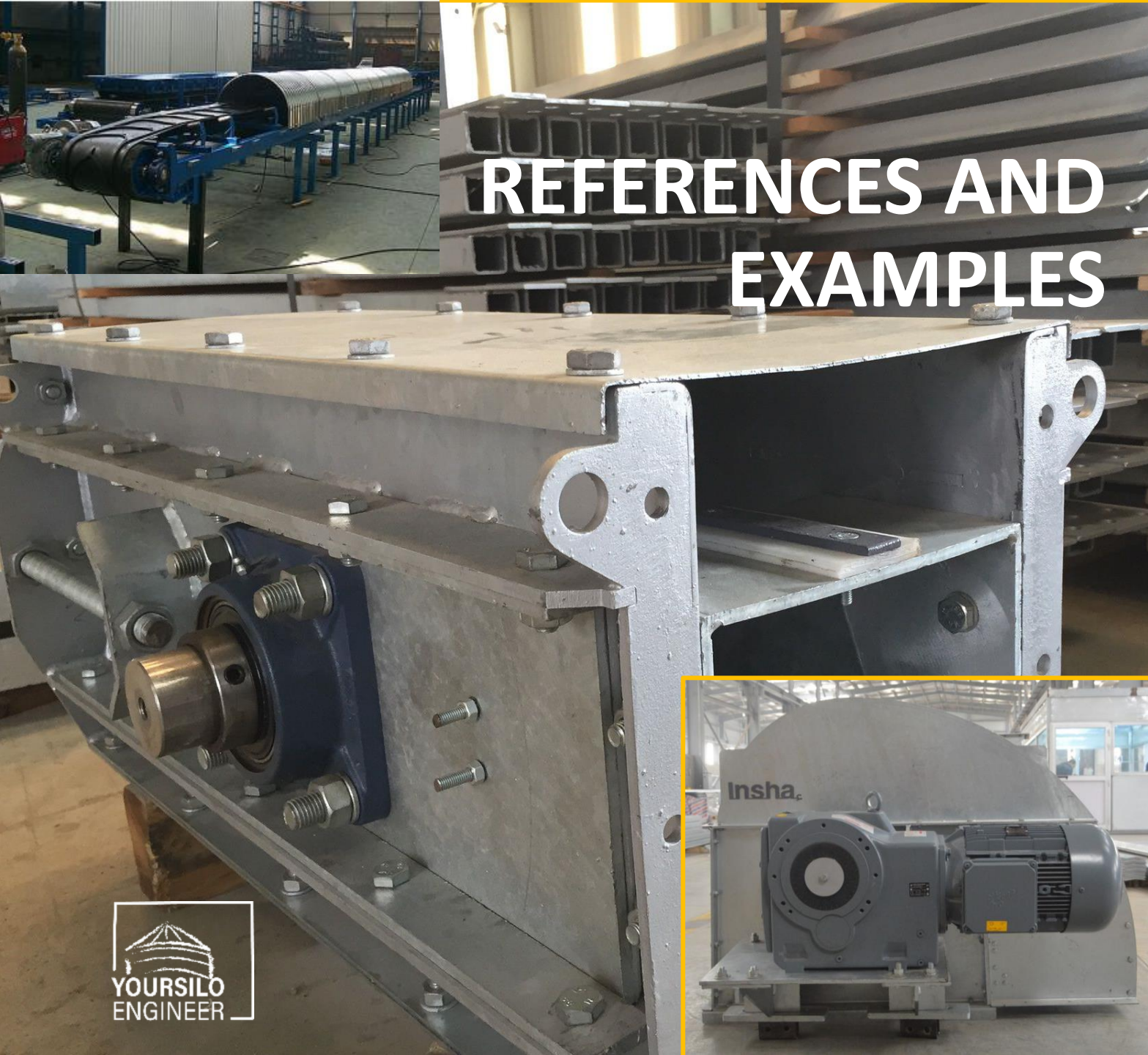


REFERENCES AND EXAMPLES

AERATION STUDY AND RETROFIT

- Aeration study on existing concrete silos
- Performance evaluation of different manufacturers fans
- Proper fan proposal base on silo geometry, crop type, fan performance curve
- Min. aeration surface study
- Retrofit proposal for full floor aeration systems
- Retrofit proposal for fully perforated ventilation cones
- Location: South Africa





REFERENCES AND EXAMPLES

GRAIN HANDLING EQUIPMENT DESIGN

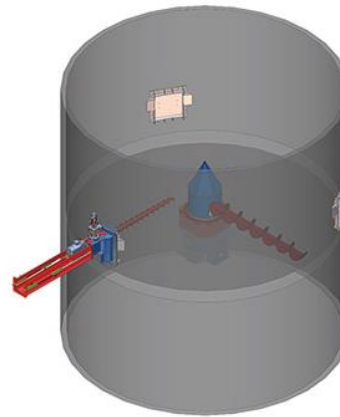
- Development of handling equipment
- Performance improvement of existing equipment
- Maintenance of installed equipment
- Engineering and development of new equipment
- Bucket elevators
- Chain conveyors
- Belt conveyors
- Calculation of power needs
- Selection of chains, buckets, belts, liners
- Calculation on safety factors of different components
- Manufacturing drawings
- Location: Egypt



REFERENCES AND EXAMPLES

SILO OPERATIONS

- Non free flowing product stored in silo
- Emergency emptying proposal
- Study of appropriate storage and unloading system
- Silo structural review
- Installation and set up supervision
- Location: Africa



REFERENCES AND EXAMPLES

GRAIN SILO PLANT DESIGN AND SUPPLY

- 2 x 1500 tons flat bottom silos
- 2 x 500 tons hopper bottom silos
- Basic design
- Architectural drawings and foundation loads
- Assistance to civil work contractor
- Manufacturing,
- Supply and installation
- Project management, integration of 3rd party delivered handling equipment.
- Full calculation report for authorities approval (required for building permission and commissioning)
- Location Cooperative, Germany

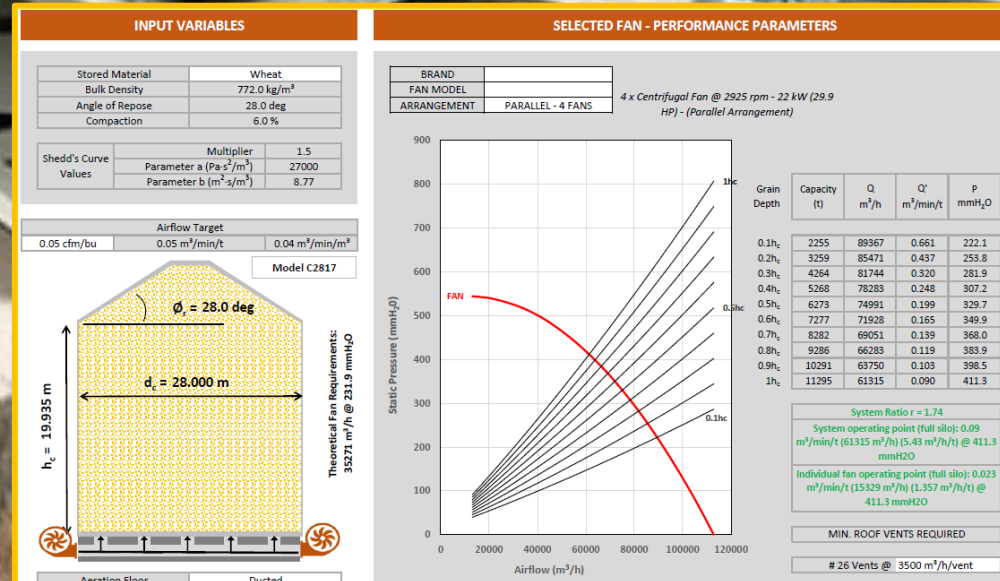
2x1500/2x500 MT



REFERENCES AND EXAMPLES

AERATION STUDY VARIOUS LOCATIONS

- Study of appropriate fans for grain silo aeration
- Acquisition of various fan performance data of various manufacturers
- Calculation of aeration performance based on
 - Silo geometry
 - Product to be stored
 - Fan power, performance curve and fan working point.
 - Selection of appropriate fan
 - Location: Various worldwide





REFERENCES AND EXAMPLES



Corrosion inside a grain bin

AERIAL INSPECTION VARIOUS LOCATIONS

- Aerial inspection of silo plats
- Internal and external aerial silo inspections
- Approved and certified pilots
- Assessing the amount of grain stuck to the walls and ladders
- Assessing the condition of the vertical hanging temperature cables
- Examining the base concrete and pit concrete structure
- Inspecting the roof feeding port
- Looking for corrosion and damage to the overall bin
- Looking for holes in the walls and roofs of the bin

REFERENCES AND EXAMPLES

FUMIGATION + N2 FUMIGATION

- Standard Fumigation based on Ph- gases
- Fumigation methodology based on controlled Nitrogen atmosphere
- The use of nitrogen in the storage of cereal grains is not subject to phytosanitary approval, as no active ingredient is available.
- Effectivity is by the displacement of oxygen
- The germination capacity of the grain is not negatively affected
- Study of metal silo sealing methods for improved fumigation effectivity
- Location: various



REFERENCES AND EXAMPLES

SILO CLEANING & HYGIENIZATION

- Silo cleaning & hygienization projects, of bulk feed tanks (farm silos), grain silos and other vertical tank (meal silos).
- Control/prevent growth of fungi, bacteria, insects and other sources of biological contamination from previously stored grain lots.
- Eliminate cross-contamination of products.
- Eliminate adhesions of products on the wall of the silo, which are nests of insects, bacteria and other sources of cereal infestation (Mycotoxins).
- Cleaning of adhesions to uncover areas of the silo that may need maintenance, and/or repairs



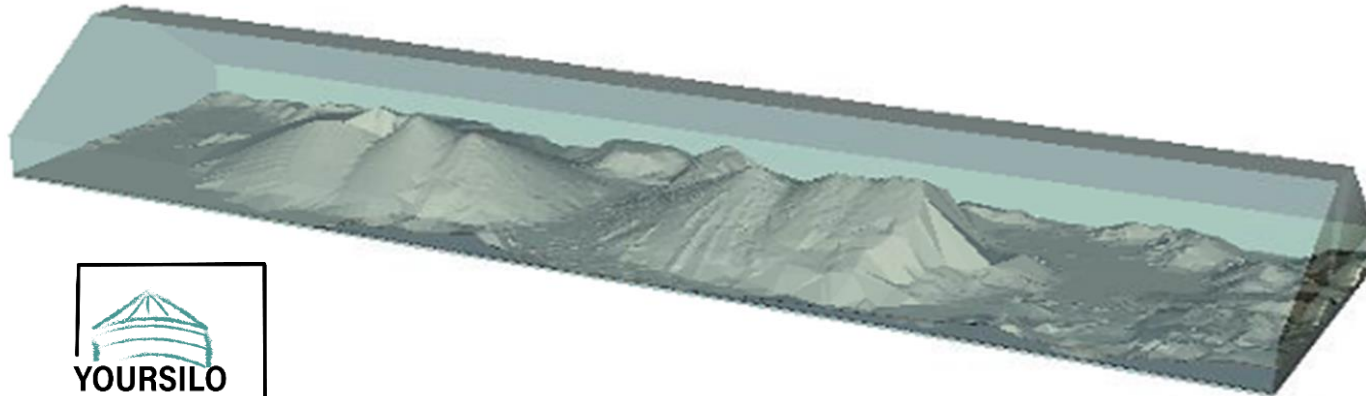
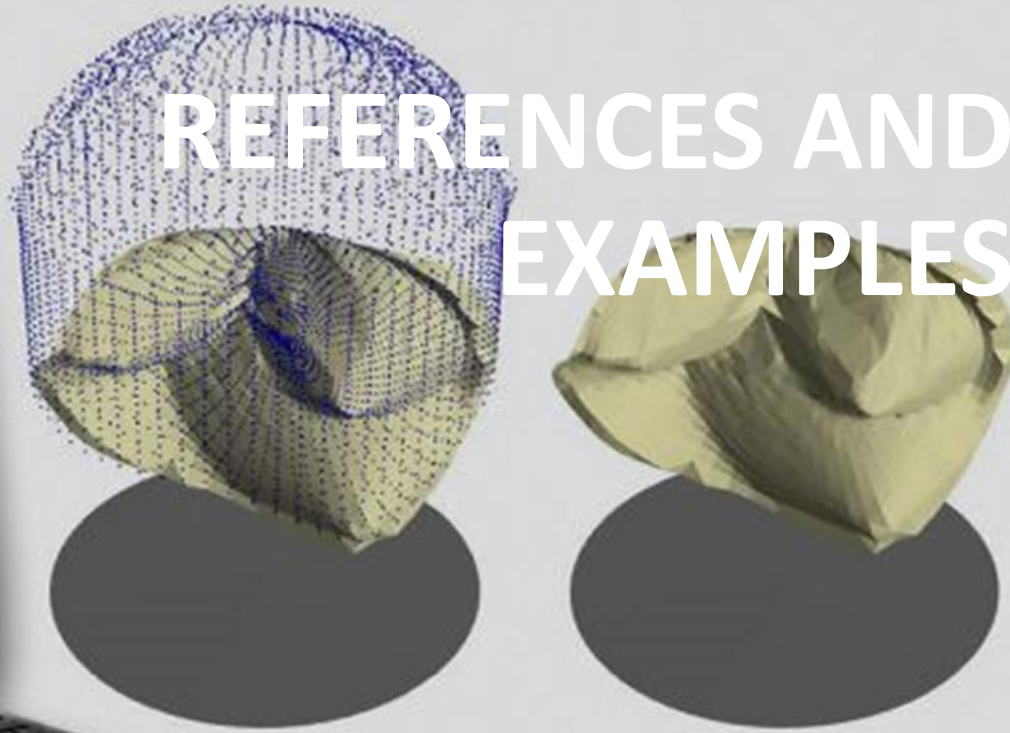
REFERENCES AND EXAMPLES

ALTERNATIVE STORAGE SOLUTIONS

- Alternative storage solutions
- Silo Bunkers
- Mobile farm silos / Grain Dams
- Square silos
- BFT's and water tanks
- INOX Steel tanks

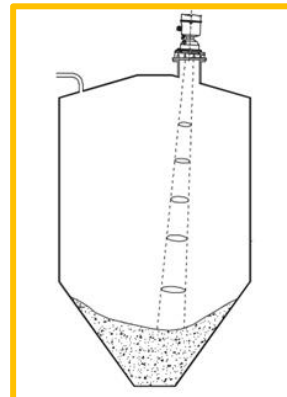


REFERENCES AND EXAMPLES



CONTINUOUS LEVEL MONITORING & INVENTORY MANAGEMENT SYSTEMS

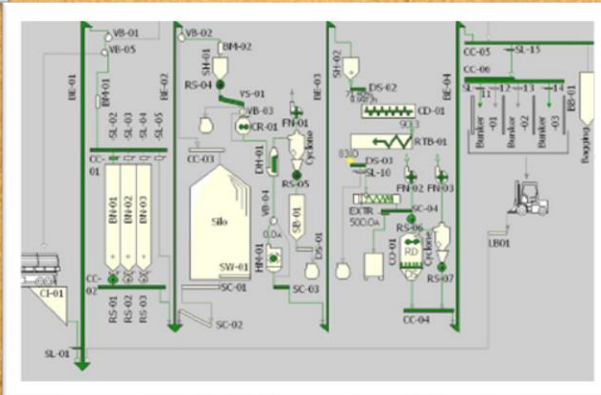
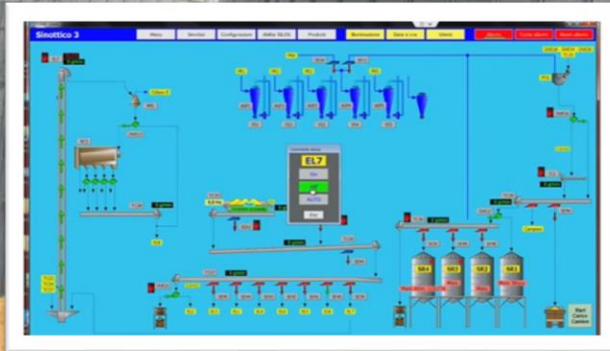
- Continuous level measurement
- Inventory management systems
- Silo, farm silos, bunkers & stockpiles
- Theft control
- Reconciliation between books and stock, daily
- Awareness of inventory, storage conditions product quantity and quality
- Laser & radar based systems
- Location: Various Worldwide



REFERENCES AND EXAMPLES

PLANT AUTOMATION (RETROFITS & UPGRADE FOR EXISTING FACILITIES OR GREENFIELD PROJECTS)...

- Intake installations and air filters
- Discharge chain conveyors
- Screw conveyors
- Bucket elevators
- Cleaners / Pre-cleaners
- Product sensors
- Pipe magnets
- Distribution chain conveyors
- Pneumatically or manually controlled outlet slides
- Silo discharge equipment
- Valve boxes, slides and pipework
- Centrifugal fans and chillers

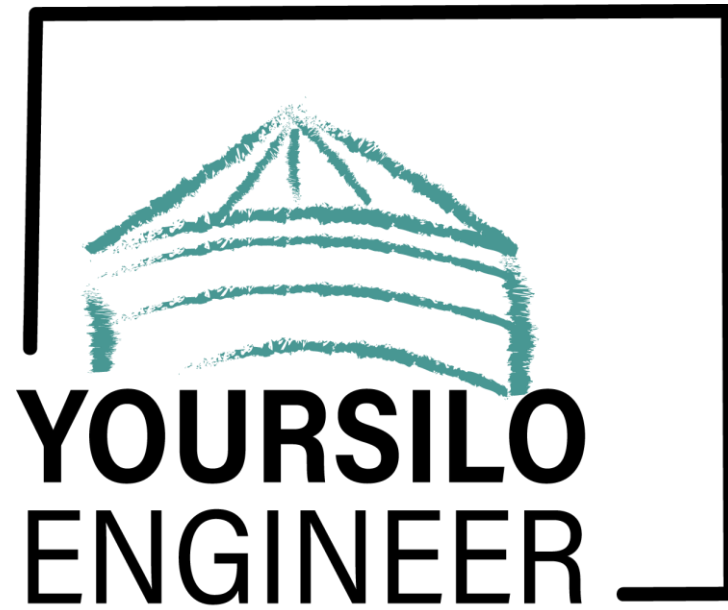


REFERENCES AND EXAMPLES

SILO LIFTING EQUIPMENT

- Rental, sale & service of electrical silo lifting equipment
- Reduce the manpower required
- Increase safety
- Design according to safety normative and EC Machinery Directive 2006/42/EC
- Up to 5 tons per lifting jack
- Synchronized and levelled lifting, automatically
- Lifting stroke up to 2 wall sheets
- Adjustable for any brand





Specialists in **grain storage silos**
since 25 years

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