



### Organisation Design in Process Industry

The ergonomics approach to systems design has the same basic structure as the common technical design approach, so it can be easily integrated:

- Problem Definition Phase
- Analysis Phase
- Basic (functional) Design Phase
- Detailed Design Phase

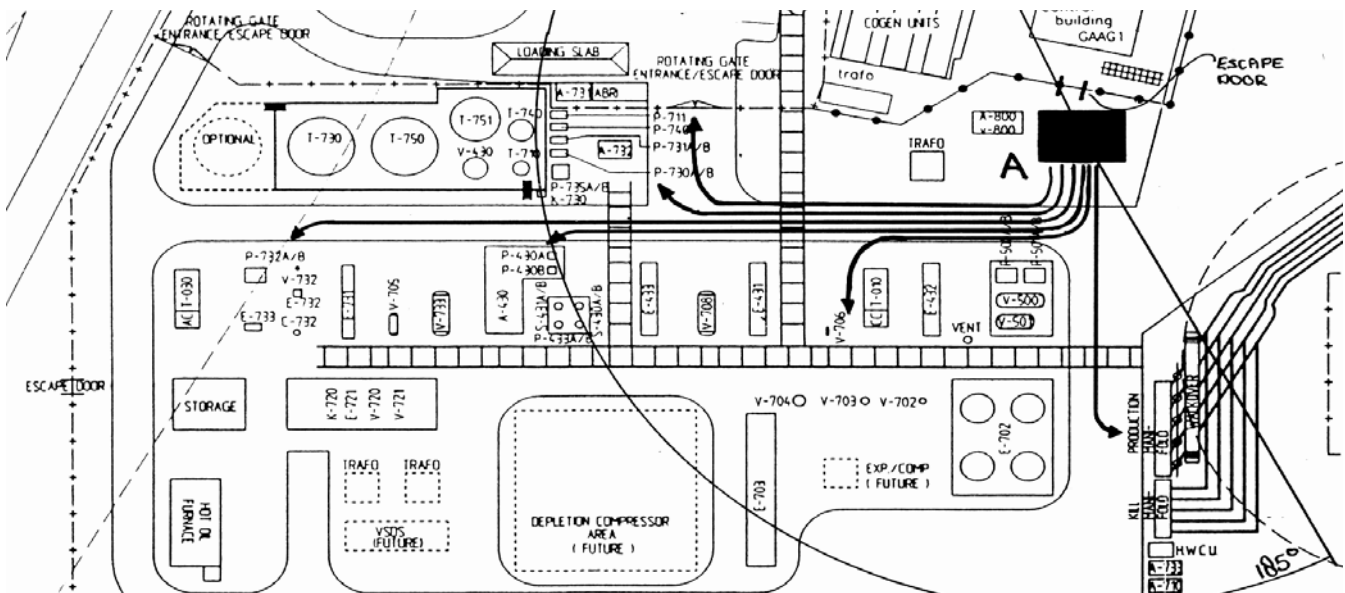
In system ergonomics the Analysis Phase and the Basic Design Phase are of utmost importance. A unique part of the Basic Design Phase is a *Task Allocation Step*, in which system tasks are explicitly allocated to the human or technical parts of the system.

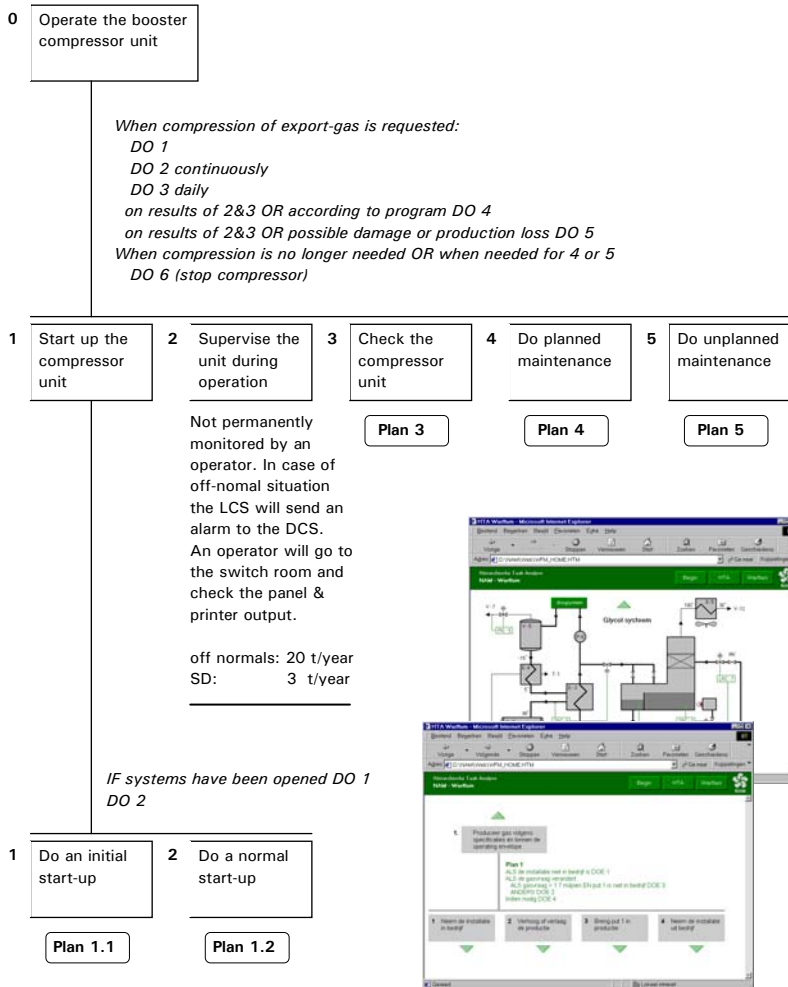
The output will be an estimate of the number of operators needed to run the system. One or two operators more or less, in a five-shift operation, makes not only a large difference in the operational costs, but also in job quality, workload and peak load handling. Ergonomics provides tools to collect or estimate the required job data. The approach will always be bottom-up: starting with an inventory of all the things to be done in a plant (tasks), combining them into jobs and finally fitting the job into a local work organisation.

### Human Factors in oil & gas plants

Process Industries recognised the importance of Human Factors long ago, initially focussing on the relationship between human operator behaviour and safety issues. From this point, human factor specialists (ergonomists) have been designing control rooms and operator jobs for some 40 years. More recently, plant design also gained interest. Some new topics are automation level, unmanned remote-controlled plants, field tasks & plant layout (routing and walking distances), maintenance task design, manual materials handling, accessibility of equipment, and manpower reduction.

In the past 15 years ErgoS contributed to a variety of these projects for leading companies, such as General Electric Plastics, Akzo Nobel, Dupont de Nemours, DSM, Lyondell, NAM, Shell, Esso and Gasunie.





## HTA: a powerful tool for Task Analysis

The Hierarchical Task Analysis (HTA) is a highly structured tool for task evaluation and job design.

- Basically, an HTA consists of *tasks* and *plans*. A top level instruction (= task) is divided in detailed (sub)instructions. The accompanying plan connects these instructions. On the next level, each instruction may be divided in more detailed instructions.
- Each instruction gets an estimate of frequency and time spend. These estimates are the basis for workload assessment.
- The depth of the hierarchy may differ per task and will be determined by *stopping criteria*.
- The HTA focuses on the human system part. However, it is perfectly suitable to describe machine tasks as well. Thus, it becomes a tool for decisions on automation issues (task allocation), manning level, etc.

In case of process plant analysis the data may be substantial and complex. Representation formats can be textual reports, (including tables), graphical oriented tree structures or computer database structures (intranet).

## HTA - Data acquisition

An HTA requires detailed task information. To control the amount of time spend on data collection, efficient methods are used. ErgoS developed a method for data acquisition based on *user participation*.

This method consists of several interactive meetings and additional on-site observations and interviews. Typical participants to the HTA-meetings are process technicians (operators), process control engineers, operations management, maintenance technicians, safety officer, etc. During data acquisition, feed back loops are essential. Each meeting is started by reviewing a compilation of the results already achieved.

A successful HTA requires an experienced session leader, e.g. to cope with features of the HTA, and in addition a minutes secretary.

ErgoS Engineering & Ergonomics is specialising in human-centred design of production systems, including process plants, control rooms and human computer interaction. ErgoS is an independent consultancy and engineering company for all kinds of Human Factors projects, including job design and work organisation design. The range of activities includes contributions to feasibility studies up to detailed design of individual workplaces. ErgoS works according to the international Code of Practice for European Ergonomists. More information is available on our website [www.ergos.nl](http://www.ergos.nl) (though mainly in Dutch). You may contact:

ErgoS Engineering & Ergonomics  
 ir. R.N. Pikaar Eur.Erg., managing director  
 PO Box 267  
 NL 7500 AG Enschede  
 Netherlands.

tel. +31 53 428 0500  
 fax. +31 53 436 1761  
 mail [info@ergos.nl](mailto:info@ergos.nl) or [r.pikaar@ergos.nl](mailto:r.pikaar@ergos.nl)