

## System description

### Functionality

### Operation

#### TURNKEY SOLUTIONS

There are many variables to take into account when fitting a blending system and our highly skilled engineers will adapt our system to fit your exact requirements.

#### TECHNICAL SUPPORT

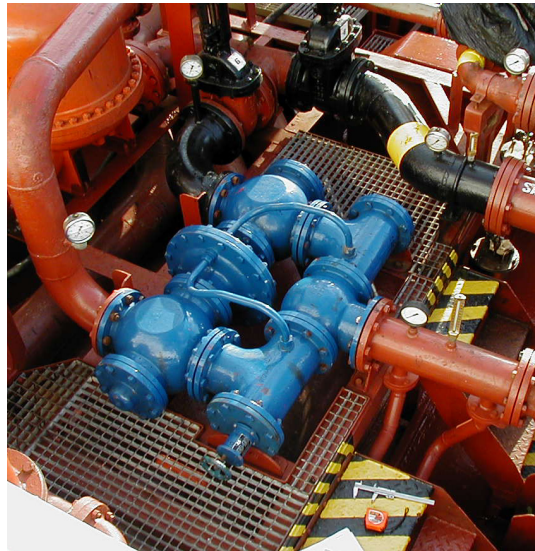
We are with you all the way. Before, during and after the installation to secure a flawless integration and operation.

#### ZERO DOWNTIME

As a central part of a bunker delivery system; mechanical stability, toughness and durability is an important aspect of the manufacturing and design philosophy.

For more information on these or other of our products or services please visit us on the Web at:

[www.cbi.dk](http://www.cbi.dk)



## General

The blending of two or more fluids at a pre determined ratio in order to produce a finished or semi finished product is a very common operation in the petroleum and chemical industry.

In most cases the measured components are fed, one by one, to a blending tank and as thoroughly as possible intermixed, but when larger volumes are involved this "batch blending" method has become substituted by "in line" blending where the components, in controlled flow corresponding to the ratios, are fed simultaneously to an intermixing device from which the finished blend flows.

In the petroleum industry the blending of a light distillate with a heavy fuel product in specific ratios, in order to produce oils of various grades, is widely used.

Generally the blending is done at the refinery of a larger main terminal, either as batch or in line blending, then the different grades are carried to the distribution terminals to be supplied to final customer. Thus it becomes necessary to equip each distribution terminal with at least one tank for each premixed grade.

Tanks, including pumps and piping, represent large investments. With just one blending unit installed at the distribution terminal these tanks would be obsolete or could be used for other purposes making savings in investment very considerable.

The CBI Mechanical Blending Unit represent an entirely new development.

- **It is inexpensive**  
No need for auxiliaries like electric motors and compressed air
- **It is easy to operate**  
A hand wheel, changes the ratio setting shown on the counter. Once the ratios for different grades are determined the operator turn the handwheel until the ratio match the counter.
- **It is easy to install**  
The unit can be mounted as an ordinary valve. No housing is required. In very cold climates or when heavy oils are used, it can be wrapped in a heated and insulated cover. Units installed north of the Arctic Circle operate successfully in this way.

## Functionality

The CBI Mechanical Blender [Fig. 1 overleaf] consists of two balanced regulating valves (1) and (2) with inlets for two components and outlets to the blending chamber (3) The valve discs are united with a stem carrying the diaphragm (4), mounted in the housing (5). A horizontal movement of the diaphragm will throttle one valve and simultaneously open up the other. In the blending chamber (3) the slide (6) can be moved horizontally by turning the threaded spindle (7) with the hand wheel (8).

The slide (6) has, on both sides of its dividing wall, two openings to the blending chamber (3), and by moving the slide to the left, the opening areas A1 will decrease and the areas A2 increase; the opposite happening when the slide is moved to the right.

The spindle (7) is geared to the counter (9), equipped with a pair of figure rollers showing the percentage ratio of the component at the mere side of the unit. When the slide is in centre position and the areas A1 and A2 equal, the counter shows 50/50. If the slide is moved to the left and A1 is decreased to 25% (and A2 simultaneously increased to 75%) of the total opening area, the counter will show 25/75. Thus any operator understanding simple figures can adjust the unit to desired ratio setting.

From a point on each side and immediately before the opening in the blending chamber two pipes (10) connect with the corresponding sides of the diaphragm housing. An increase in pressure on the left side of the system will cause the diaphragm to move to the right, throttling valve (1) and opening valve (2), which will reduce the pressure on the left side of the system and increase pressure on the right until pressures on both sides are equal. As the connecting pipes (10) are short and the valve's inertia small the regulating acts extremely fast.

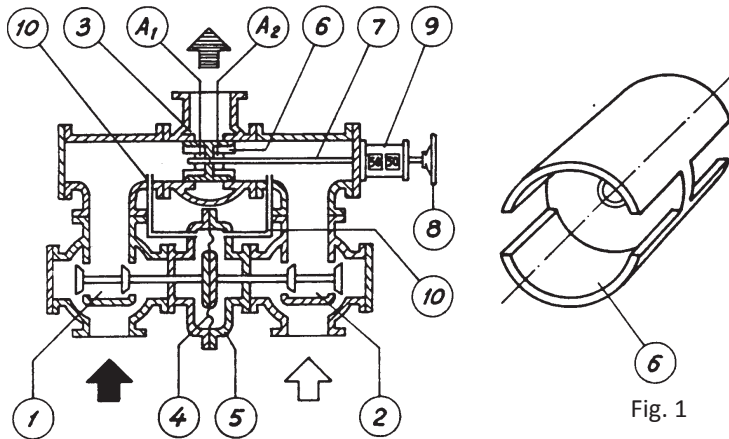


Fig. 1

## HOMOGENITY

The areas A1 and A2 represent a considerable restriction in flow area and will, therefore, create a strong turbulence with corresponding pressure drop. The turbulence, in connection with the shape of the blending chamber, gives a very thorough intermixing of the components and the blend becomes homogenous.

To create the required turbulence it is necessary that the flow through the openings has a certain minimum velocity. If the flow rate is decreased below 30% of the recommended, turbulence might not be strong enough to give a reliable homogeneity.

The various possibilities are practically unlimited and the flexibility of a small or medium sized terminal can be greatly increased by installing the CBI Mechanical Blending Unit.

## ACCURACY

Between 50 to 100% of the recommended capacity [Fig. 2] the accuracy at ratios from 40:60 to 60:40 is better than  $\pm 0.5\%$ . At 20:80 to 80:20 it decrease to  $\pm 1\%$ ; and at 10:90 to 90:10 it decrease to  $\pm 2\%$  of the ratio setting. Below 10:90 and 90:10 respectively the accuracy varies considerably and it is not recommended to go outside these values.

Accuracy can be improved by adjusting the inlet pressures, outside the blending unit.

The procedure in starting up a newly installed blending unit is very simple and is described in detail in the manual sent with every unit. At normal flow rates the pressure drop over the blending unit is about 10-20 psi (depending on blending ratio, the viscosity of the components etc).

Therefore the pumping pressure must be adequate to overcome this without the difference in pressure between the two components being too large.

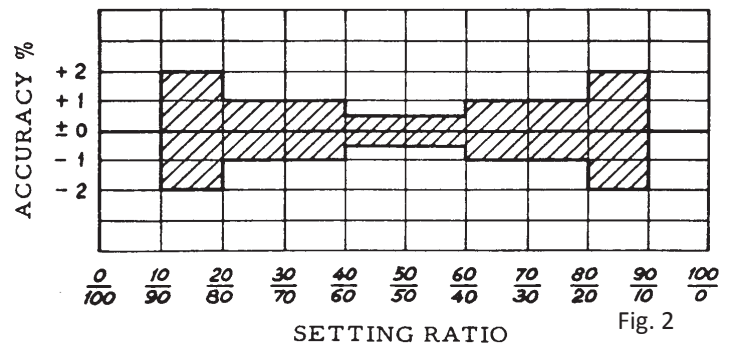


Fig. 2

## ADJUSTMENT

The CBI Mechanical Blender is factory set to a blending ratio of 50:50. During the actual blending operation, however, a ratio of e.g. 80:20 or 20:80 is common. It is therefore recommended to adjust to the ratio mostly used.

The adjustment is easily made in a few minutes using a normal screw driver.